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Parkerizing—A Rustproofing Process

What the Parker Rustproofing Process Is—The Three Operations in Its Application—Kinds of Parts Treated—Apparatus and Equipment Required

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RUST, formed by the chemical action of water, atmosphere and iron is visible evidence of the destruction of iron and steel and constant vigilance is required to prevent its formation. Without the actual getting together of the iron, water and oxygen from the air there can be no rust. If polished iron or steel is kept *perfectly* dry, it will stay polished, or if it is kept covered by a substance that will keep away water (moisture) the polish will remain.

Oil, if thick enough and viscous enough, will keep the iron free from water when it is applied as a coating on the metal, and is fairly efficient as a rust-preventing agent. But its use generally interferes with the utility of the article protected. A better protection would be a substance that would adhere to or be a part of the metal and still permit it to be handled. Three general methods have been used to provide such a protection, namely, the application of an organic substance (painting, lacquering, enameling), the application of an inorganic substance (galvanizing, electroplating, metal spraying), and the chemical conversion of the surface of the object being protected (browning, bluing, blacking and other processes).

"Parkerizing" belongs to the conversion method. It consists in changing by chemical action the surface of the metal to form other substances that will not change into rust. The substances so formed are basic iron phosphates (ferrous phosphate and ferric phosphate), insoluble in water and permanent in the air.

The Parker process is the property of the Parker Rust Proof Co., Detroit, Mich., which licenses manufacturers for its use. It is a development from two English patents, one purchased from Thomas Watts Coslett, the other from Frank Rupert Granville Richards. The first contemplates the use of a dilute solution of phosphoric acid with iron filings, the second the use of dilute phosphoric acid with an oxidizing agent. Improvements made by the present owners include the addition of manganese and other metals to the phosphoric acid and the development of a chemical test whereby the strength of the solution can be easily and readily controlled.

Three operations are necessary in Parkerizing—cleaning, processing and finishing. With the processing solution at proper strength, success in the coating depends entirely upon the thoroughness of the cleaning. Any method of cleaning that produces a chemically clean surface is satisfactory. Some bright parts or parts that

FIG. 1—THE PARKERIZING DEPARTMENT

The sand blasting machine is seen at the rear. On the right are alkali, rinse, pickle and rinse tanks in the order named, the alkali tank being nearest the sand blast. On the left are the processing tanks. The finishing tank, in the foreground, has the cover down and is used, for this illustration, to display components and containers. A chain block serves the tanks and blast.

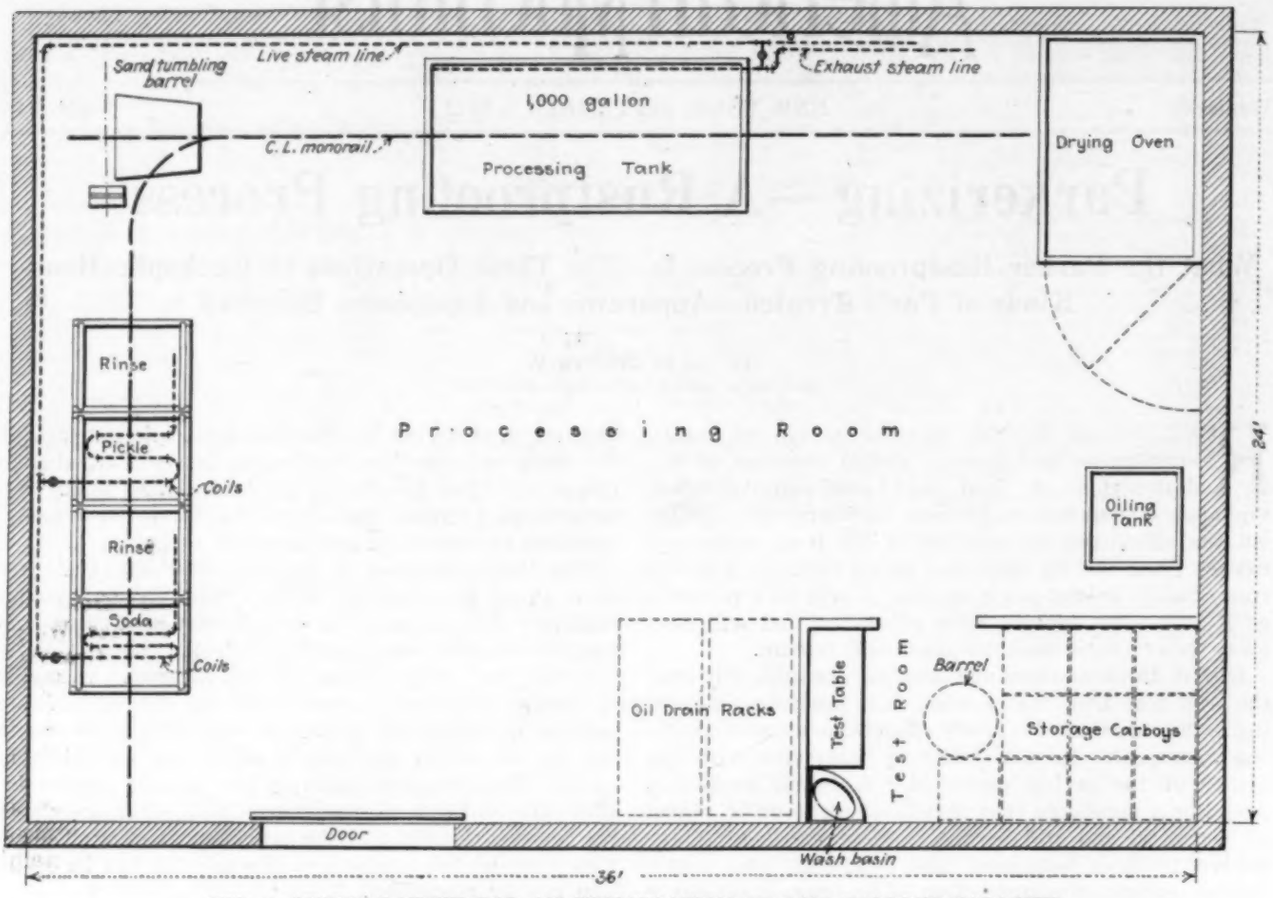


FIG. 2—MODEL LAYOUT FOR AN INSTALLATION OF 1,000 GALLONS CAPACITY

have been machined all over can be processed without further cleaning. Sand blasting is the best method of cleaning, but pickling can be used successfully if all pickling residue is removed before processing. Pickled surfaces process less quickly than sand blasted surfaces.

When pickle is used as a cleaning medium the operations normally are as follows:

(1) Alkali wash
(2) Rinse
(3) Pickle
(4) Rinse
(5) Sand rub or sand roll.

The article is then ready for processing. For best results alkali water must be used at a boiling temperature and all rinse waters must be boiling. The temperature of the pickle itself, which frequently consists of one part of sulphuric acid to seven parts of water should not be higher than 180 deg. F. and not lower than 160 deg. F. A pickling solution recommended for the process consists of one gallon of water to four fluid ounces of sulphuric acid and a limited amount of sodium bisulphite. The bisulphite is added in small quantities in the ratio of one pound to one hundred gallons of pickle from time to time during the day's operation. The object of the bisulphite is to supply sulphur dioxide gas which renders iron scale more soluble in the pickling solution. It is necessary that the sodium bisulphite be added under the surface of the water, because if it were put in on the surface all the gas would be liberated there and would pass immediately into the air.

The object of the sand rubbing or rolling is to remove such pickle residue as the rinse may fail to take off and it must be carried on with great care. Rubbing is ordinarily a manual operation and is used only on such parts as cannot be rolled with sand in a barrel. Where it is required a shallow box containing sand from 3 to 6 in. deep placed on a table or bench is often provided for this purpose. The articles may be rubbed with a brush or a cloth or rubbed directly in the sand.

Rolling is merely tumbling with sand after final rinsing and drying. The tilted tumbling barrel is considered best for this operation because with it the amount of fall can be regulated. The duration of

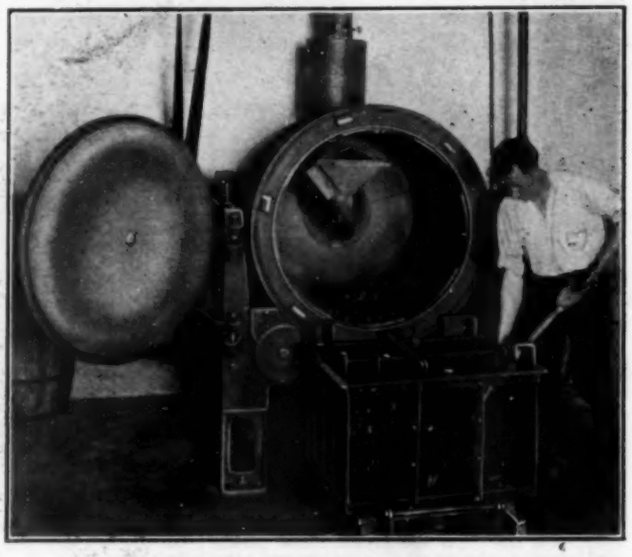


FIG. 3—LOADING THE SAND-BLASTING MACHINE

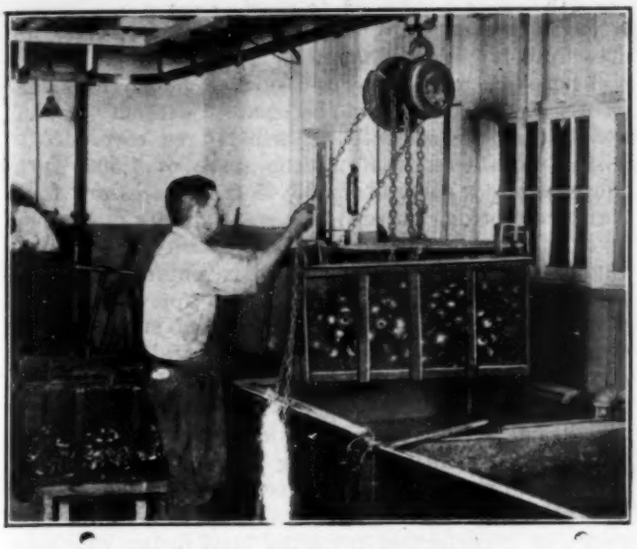


FIG. 4—CLEANING BY PICKLING

The basket of parts has been taken from the alkali wash and is about to be rinsed. It will then move to the right to the pickling tank and after that to the rinse tank. Inside dimensions of the tanks: length 4½ ft., width 4 ft., depth 3½ ft.

tumbling varies from 5 to 20 min. and the speed of the barrel from 15 to 45 r.p.m. A clean sharp sand is used. For parts that are small or fragile the sand should be of such size that it will pass through 40- or 50-mesh screen. Coarser sand may be used for larger pieces. The barrel is often fitted with a screen cover so that the sand can be removed by turning the barrel downward and the parts left clean. In other cases a shallow box is provided with a coarse screen cover on which the full load of the barrel is dumped, the sand passing through the screen. A variation of the rubbing process involves the use of a wire brush to help in removing the residue from receptacles or pockets.

The method of cleaning by sand-blasting makes unnecessary the washing, rinsing and rubbing operations. Ordinarily no other cleaning is done although in special cases a combination of chemical cleaning and sand-blast may be desirable. A very fine velvet surface may be produced by first pickling and then sand-blasting with fine sand at very low pressure.

Any method of cleaning that will produce a chemically clean surface is satisfactory for Parker process and in many shops individual ideas have been worked out with success. Tumbling, with an abrasive in the presence of the cleaner, may remove the burrs from stampings and at the same time produce very fine surfaces for Parkerizing. Electric cleaners are also used in some cases. The cleaning operation may serve two purposes—that of removing the scale and other foreign matter from the surfaces, also of scouring and polishing the surfaces so as to secure the most desirable finish for the processing operation.

The amount of time necessary for the various sub-operations depends upon the nature of the work. On a 0.30 caliber rifle barrel the alkali wash required 10 min. immersion, first rinse 3 to 5 min., pickling 30 sec., second rinse 3 to 5 minutes.

Processing

After cleaning, the articles are immersed in the processing solution for from 40 min. to 2 hr., the length of time required depending upon the nature of the work. The bath is maintained at a temperature of 210 deg. F. Proper immersion will leave all surfaces in free contact with the solution. To secure that condition the articles are placed in steel baskets, racks or trays such as shown in Figs. 5 and 6. The tank itself is of steel, arranged with steam coils to heat the solution. A bath can be used over and over, but loses strength for every surface processed. To renew it, chemicals must be added from time to time, the amounts depending upon the loss in strength indicated by a well-defined and positive test. For small articles the tank contains a cylinder or barrel made of perforated metal, that is revolved slowly by a mechanical device. The purpose is to expose all surfaces that are to be coated to the action of the processing solution. Reference has been made to heating the solution by steam, but tanks can be arranged for gas heating as well.

The physical evidence of change is a vigorous bubbling in the solution that begins as soon as the work is immersed. This bubbling is the evolution of hydrogen gas. It decreases after about 15 min. and when it ceases altogether it indicates that the chemical action is complete. It is desirable to leave the work in the solution a short time after the bubbling action ceases

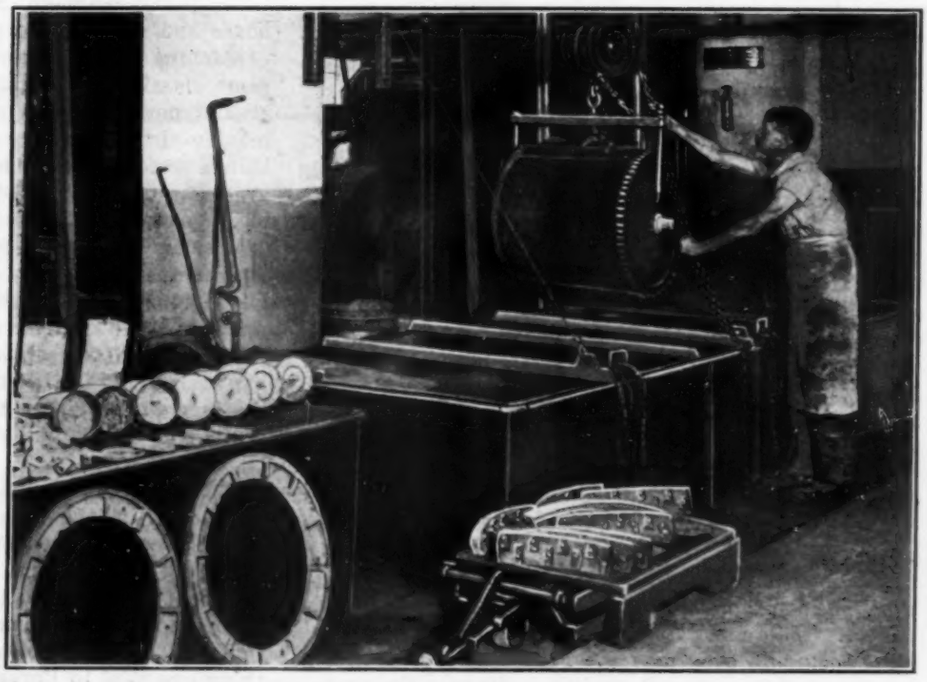


FIG. 5—PROCESSING

Showing a rotating cylinder made of perforated metal, used for processing small parts. The processing tanks are of 1,000 gallons capacity and the dimensions are 9½ ft. long, 4 ft. 2 in. wide and 4 ft. deep. Processed parts are shown at the left and on the truck. The large rings and segments are parts of tire molds. The small cylindrical containers lying on top of the tank cover are made of screen. They are loaded with parts and are placed in the rotating cylinder for processing, preventing, in that way, the mixing of parts.

FIG. 6—FINISH DIPPING AFTER PROCESSING
An oil drain board is shown in the foreground. Baskets of various shapes are used as containers for the parts.

and no harm results if the work is left in longer as the chemical action entirely ceases as soon as the surface of the metal is completely converted to iron phosphates.

What actually takes place on the iron or steel is that minute particles of iron are dissolved from the surface and are replaced by the phosphates of iron contained in the solution, this change continuing until the entire surface consists of iron phosphates instead of iron. The analysis of the solution that brings about this change is: H_3PO_4 (orthophosphoric acid) in quantities less than $\frac{3}{4}$ of 1 per cent; phosphates of iron and mangenese; water about 99 per cent.

Manganese dioxide is added to serve as an oxidizing agent, its function being to accelerate the reaction by removing the hydrogen in the form of water.

FINISHING

After processing is complete the work is removed and allowed to dry, without rinsing. Pieces of appreciable volume will retain enough heat from the baths to dry themselves. Where large quantities of small thin parts are processed a drying oven or a hot plate will greatly accelerate the drying. The finishing operation consists of the application of a neutral mineral oil that brings out a characteristic grayish black mat finish. An additional chemical dip has been developed by the Parker company that, if applied before dipping in oil, will give a permanent black color, much deeper than the mat produced by the oil dip alone, and will add appreciably to its rust-resisting qualities. The most recent development has been the partial change of the phosphate coatings with certain organic chemicals, the modified coatings having a far greater resistance to rust. The solution used contains also phosphates of manganese. There are other preparations for finishing, some requiring oven drying. Paint may be applied, as may enamel, lacquer and similar coatings. The process does not make an undercoating for plating.

The amount of building up on a surface is not over 0.0003 in. and frequently there is no increase in size. Other physical properties of the metal treated remain practically the same. Temper, magnetism and tensile strength are not affected to any extent. Processing does interfere somewhat with spot welding. Solder will not stick to a Parkerized surface, but articles that have been soldered can be coated without trouble, except that the solder itself will not be covered.

It is considered that a floor space of 1,500 sq.ft., equivalent to a room about 35x45 ft. is necessary for a standard installation of 1,000 gal. capacity. A model layout for an installation of that capacity is shown by Fig. 2. A tank is expected to turn out four loads of processed parts per 10-hr. day at an approximate cost of $0.006 per square foot of processed surface. The equipment required for a complete installation (much of which may be omitted in many cases) is as follows:

Cleaning equipment, when sand-blast is not used: 1 alkali tank, 1 rinse tank, 1 pickle tank, 1 or more cleaning baskets, 1 tilting tumbling barrel.

Processing equipment: 1 processing tank with steam coils or gas for heating; processing baskets, or trays, or racks, or a perforated revolving steel drum, whichever may serve the purpose best, depending upon the nature of the material to be processed.

Finishing equipment: 1 or more steel tanks for dipping, depending upon the finish required; 1 or more baskets for dipping; 1 or more drain boards; for special finishes—a drying oven.

Testing: A simple testing equipment that can be used successfully by a workman of average intelligence.

Parker process is adaptable to parts produced in many industries, not only to add to their life while in service but for preservation while in stock and to enhance their appearance.

Electrical equipment is frequently placed in basements or cellars where it is exposed to dampness and on that account is equipment that should be protected by a rust-proof coating. Among the parts adaptable for the coating are telephone instruments and bell boxes, timer parts, magneto, motor and starter parts, meter boxes and switchboard parts.

Machine and instrument parts that fall under the same classification include parts of automobiles, cameras, typewriters and similar machines, phonographs, moving-picture machines and sewing machines. Automobile accessories such as chains, springs and jacks are continually subjected to weather and on that account merit protection. Lock parts are in the same category. Molds for tires and parts made from celluloid and similar materials have been found to be benefited by Parkerizing in that the amount of cleaning is very much reduced and there is less likelihood that the part being formed will stick to the mold. A peculiar use has been found in the canning-machinery industry. The coating, while it may react with the organic acids of fruits and foods, will not produce a substance that is harmful if eaten.

A Parkerizing plant in operation on commercial work is shown in the several illustrations. The photographs were obtained at the plant of the Pyrene Manufacturing Co., Newark, N. J., where Parkerizing is one of about eighteen methods of finishing metal parts, conducted in a department devoted to commercial finishing. With the exception of a tumbling machine everything essential to Parkerizing is shown in Fig. 1, sand-blast, alkali, pickle and rinse tanks, processing and finish-dipping tanks. Closer views of the operations are shown in Figs. 3, 4, 5 and 6. Drying baskets and draining apparatus are conspicuous in the last illustration.

Employee Suggestion Plans

Reward for Suggestions in Money and Promotion—How the Priority of Suggestions Is Determined—Some Successful Plans in Practice

By SANFORD DeHART
Director of Hospital and Employment, R. K. LeBlond Machine Tool Co.

"WHY was Jim Smith selected for the job of plant engineer? He has had no college education, and so far as I know he has received no training which would particularly fit him for the position of plant engineer."

"Jim was appointed to the position of plant engineer largely because he has been a consistent prize winner in suggestion contests. The big boss was of the opinion that a man who could think of so many different valuable suggestions would make an ideal plant engineer."

The foregoing colloquy took place between a workman and his foreman in a factory in the Middle-West. The manager of this factory made it a practice to select men for positions of authority on the basis of the valuable suggestions they submitted. Several of his men "woke up one morning and found themselves famous" because of some hidden talent brought to light by their suggestions. This manager is very enthusiastic about the results he has obtained from the suggestion system which he inaugurated in his plant twenty-three years ago.

A department with a personnel of ten persons devotes its entire time to investigating and answering suggestions which are either sent to them through the mail or deposited in locked boxes provided at the entrance of each department. After the suggestion department has reviewed a suggestion, a final disposition is made of it by a committee consisting of the factory manager, controller, chief engineer, office manager, supervisor of the order department, assistant sales manager, chief inspector, efficiency engineer, supervisor of the assembling department, one man of the rank and file, and the head of the suggestion department.

Each suggestion is copied without the name of the suggestor and is referred to the head of the division affected, who submits a report to the suggestion department. If this department thinks the report satisfactory, it passes the report on to the suggestor. If the report is not satisfactory, a further investigation is made by either a member of the suggestion department, or some other head of a division.

If the idea is not accepted, a letter is written giving in detail the reasons for not adopting it. In its reply, the department tries to make the suggestor feel that it was glad to have the opportunity to investigate the suggestor's idea even though the idea could not be adopted.

In the past twenty years, the company has paid its employees more than $75,000 for suggestions. Last year 8,200 suggestions were submitted by employees, and of this number 2,200 were adopted. Of the 80,000 received in the past nine years 30,600 were adopted. The largest rewards were given during the first six months of last year in which 1,009 suggestions were adopted and $10,000 awarded in prizes.

The winner of the capital prize in this contest invented a counter-wheel knurl engraving machine. The knurls had always been engraved by hand, a process which was necessarily slow and imperfect. Nine or ten hours of work were required to complete a knurl by hand, while the machine which this man invented, engraved a complete knurl in thirty-five minutes, and turned out a far better product.

From the foregoing it may be gathered that this company would be very reluctant to abandon its suggestion system. The system is a success in the plant mainly because of the personal interest taken in it by the manager, for the success or failure of any suggestion system depends largely on the personality of the one in charge. While some industrial managers are thoroughly cognizant of the benefits accruing from such a system, conversely, many manifest very little interest in suggestions emanating from the employee.

Suggestion systems are an unqualified success if the employee making the suggestion is given the proper recognition by the management. This recognition may be in the form of money, honorable mention in the factory magazine or merely a pat on the back. It is a short-sighted policy to receive a good suggestion without giving the person who made it the proper credit. Even though the suggestion cannot be used, the employee should be told the reason.

Not long ago, I visited a factory in the Middle-West, and while there saw a condition which obviously needed improvement, and which could have been made by any employee having the slightest mechanical training. I spoke to one of the employees about it, thinking that perhaps it had not occurred to him that such a condition might be improved. He informed me, however, that he was fully aware that the defect could easily be remedied, but had long since stopped making suggestions, as he had never received any credit for those he had previously made. Yet, a large box labeled "Suggestions" had been placed conspicuously in the shop; but had long passed into innocuous desuetude because of the lack

THE INSTALLATION and operation of a suggestion system are absurdly simple. The success or failure of the system, however, depends largely on the personality of the one in charge, and on the proper recognition by the management of the employee making the suggestion.

One manager selects men for positions of authority on the basis of the valuable suggestions they have submitted.

Even though a suggestion is not accepted, the employee should be told the reason and encouraged to make other suggestions. A record file should establish the priority of the suggestions received.

of interest on the part of both employer and employee.

The installation and operation of a suggestion system are so absurdly simple, that it is a remarkable thing that such a system is not universally adopted. The monthly suggestion contest of another shop in the Middle-West is fairly representative of these systems in general. The contest is open to all employees. Every submitted suggestion is given due consideration, and if adopted, worth-while awards are made. The following rules are used:

(1) All employees are eligible to submit suggestions and receive rewards.
(2) When two or more employees submit similar suggestions, the one whose suggestion slip was first received will be given credit.
(3) The idea is to be described as thoroughly as possible. Any suggestion not clear to the committee will be returned to the sender for further details.
(4) Date and sign all suggestions and give badge number.
(5) Sketches should accompany suggestions regarding mechanical apparatus, whenever possible.
(6) The stub attached to the suggestion blank is to be retained in all cases.
(7) Reason for not accepting suggestions will be given to sender.
(8) Employees may have submitted suggestions reconsidered by forwarding written request to the suggestion committee.
(9) Drop all suggestions in the suggestion box. Do not send by mail to the committee. Use the standard form of suggestion slip in all cases, but if more space is necessary to describe your idea in full, attach one or more sheets of paper to the suggestion slip. Use one side of paper only.
(10) All suggestions which bear the name of employee submitting the same will be acknowledged.

The suggestion committee meets once a week to consider suggestions made, and you will hear from your suggestion as soon as possible.

What to Suggest

(1) Improve methods of manufacture.
(2) Improve machinery or other equipment.
(3) Increase efficiency and production.
(4) Increase co-operation and united effort between individuals or departments.
(5) Improve working conditions.
(6) Eliminate waste of any kind, time, effort, material, power.
(7) Prevent accidents and increase safety.
(8) Make every job at our plant the best job of its kind anywhere.

In this company, suggestion boxes, numbering about thirty-eight in all, are located throughout the plant. Each box is numbered and the suggestions collected from the various boxes are numbered to determine the origin of the unsigned suggestions.

Upon the receipt of a suggestion, it is given a record number, and entered on a card file. These cards contain the employee's name, number, date suggestion is submitted, suggestion number, record number, to whom referred, date referred, date of receipt of reply, date closed, award and final disposition.

It occasionally happens that a number of suggestions in this plant can be closed at once. There are others, however, that may be held in abeyance for months. The record file is intended to establish the priority of the suggestions submitted in case the installation of the apparatus is made after a long period. The suggestion plan has been in operation in this plant for three years. During this period 1,045 suggestions have been submitted, of which number approximately 150 were deemed worthy of award.

One company reports that one of its best suggestions came from a young girl in the girl's department. This girl, still in her teens, submitted a suggestion which decreased by 25 per cent the cost of the product manufactured by the concern, and for this suggestion she received a $50 prize. Rewards as high as $500 have been given for suggestions in this concern and, in addition, machine safe-guards have been named after the employee who suggested them.

Another concern rewards its employees for finding defective links in crane and sling chains, presenting a pocketbook to the employee who discovers one defective link and a gold watch to the employee finding the largest number of defective links.

Foremen Sometimes Excluded from Contests

In one firm all employees except supervisors, department heads, foremen, job foremen, section heads and sales agents may compete in suggestion contests. In another firm, heads of departments, draftsmen, experimental men and others in similar positions are excluded from participation in the suggestion plan, for the management is of the opinion that any plan that causes competition between the executives and the men is undesirable. This rule is not inexorably adhered to in all establishments.

One company employing ten thousand persons has never excluded the foremen from the privileges of the suggestion system, and considers this a wise plan. Some very good ideas have been obtained from the foremen, ideas which probably would not have been brought forward had there not been a prospect of compensation.

For a time the concern tried classifying the foremen by themselves, removing them from competition with the workmen, and basing the foremen's prizes upon the awards received by the men working under them. This did not prove to be a successful plan, however, and recently the old arrangement was resumed. During the year 1921, $10,500 was paid to employees for suggestions.

A description of the operation of this system is as follows:

Suggestion blanks are placed at convenient points about the works. Any employee having a suggestion to make writes out a full description of his idea, places it in an envelope marked "manager's office," and drops it in a locked mail box nearby. If a sketch is necessary to illustrate the employee's idea, and he has not the necessary skill to make one, he is privileged to have one of the draftsmen make a simple sketch for him.

The suggestions are collected daily and sent to the manager's office. Every suggestion is there stamped with the date on which it is collected. It was found necessary to do this because on several occasions different employees made suggestions on the same thing almost simultaneously, and until the suggestion blanks were dated, the question of priority could not be determined.

As soon as the suggestion is received, a copy of it is sent to the superintendent of the department to which the suggestion applies. He investigates the merits of the idea and returns the suggestion to the office with his recommendations and reasons. In the meantime a printed acknowledgement has been sent to the person who made the suggestion. If the recommendation of the superintendent is endorsed by the manager, the superintendent is instructed to carry out the suggestion and a report is sent to the maker stating that it has

been adopted. If the suggestion has not been adopted, the maker is advised to that effect.

At the end of each month all the suggestions accepted and put in operation during the month are listed, together with a brief description of the ideas and their advantages, and a copy is sent to each member of the suggestion committee, which is composed of the superintendents of the various departments. A few days later a meeting is held for the purpose of making the awards of the prizes for the suggestions of the preceding month.

Each suggestion on the list is taken up by the superintendent who had charge of putting it into practice. The superintendent at the same time gives his idea of the prize the suggestion merits, if any. A discussion of the advantage of the suggestion follows; and a vote is taken as to the suggestions for which prizes are to be awarded, and the amount of each prize.

The suggestion boxes of another concern are in charge of the "factory conditions section" of the personnel department. The contents of these boxes are collected by the safety inspector while on his daily rounds through the factory. As suggestions are received by the superintendent of the personnel department, they are given a file number, and are acknowledged by post card. An endorsing sheet is prepared for recording investigations and decisions. The ideas are then referred to the general committee at their next weekly meeting. This committee is made up of the committee chairman who is the superintendent of the personnel department, the chairman of the factory committee on methods and improvements, the chairman of the engineering committee on inventions and improvements, and a representative of the patent department.

The remuneration for suggestions may take one of three forms, monetary consideration, advancement in position, or honorable mention. This suggestion plan has been in operation for the past eight months. Sixteen hundred persons are employed.

The number of suggestions disposed of by the committee has been analyzed as follows:

Received	127	
Acted upon	122	
Adopted—Special Reward	35	($367.50)
Adopted—Honorable Mention	11	
Good but already taken care of prior to receipt of the suggestion	2	
Good but not feasible for present adoption	19	
Not feasible	55	
Held over for further consideration	5	

The concern believes that the percentage of good ideas submitted (59 per cent of the total) speaks very well for the plan. Of the good ideas, 53 per cent had to do with improvements in manufacturing methods, 42 per cent were inprovements in design of apparatus, the remaining 5 per cent pertained to factory routine.

> THE SUGGESTION system reacts favorably upon the employee and at the same time benefits the management.
>
> Besides receiving a monetary prize, in working out his idea the suggestor gains an increased knowledge of the business which frequently leads to promotion and increased pay.
>
> An improved product, better factory and office system, new selling and advertising methods, better health and safety features and savings of thousands of dollars in production costs, are some of the advantages derived by the management.

Some of the suggestions submitted brought about large savings in the costs of production, and others solved some design difficulties. As an example of the latter, the case of a new means for lubricating the rotor bearings of large machines might be cited. The rotor bearings of this machine weighed approximately 45 lb., were equipped with ball bearings and revolved at a speed of 8,600 r.p.m. Perfect lubrication was a prime requisite to the successful functioning of the machine. One of the department foremen became interested in the problem, though his work at that time did not include the responsibility for the manufacture of that part. Nevertheless, he worked on a scheme which solved the problem and was awarded a substantial money prize by the suggestion committee.

There is no question of the good psychology in having an employee understand that his efforts along these lines are appreciated, for the system reacts favorably on the employee and also benefits the management.

One manufacturing organization employing 6,000 persons has had a suggestion plan in effect in some form since 1894. The president of this concern says: "We believe the value of the suggestion system to be almost limitless. Our plan has proved to be very profitable. It has resulted in giving us an improved product, better factory and office systems, new selling and advertising methods, better health and safety features, saved thousands of dollars in the cost of production, and in fact every phase of the company's business has been benefited by the suggestion plan.

"Another feature that should not be lost sight of is the benefit the suggestor receives besides the monetary prize, and that is the increased knowledge of the business which he gains by working out his idea. It also leads to promotion and increased pay. A large number of our executives who have been promoted from the ranks were consistent prize winners in our suggestion contests."

Spiral or Helical?—Discussion

By F. F. Dorsey

May I suggest that your discussion of the distinction between a spiral and a helix might well be extended to include a third form of curve often used in machinery, and also commonly called a "spiral"? I refer to the curve which may be considered as a compromise between the spiral and the helix, and described as the path of a point moving at a constantly increasing distance, around another point which moves along a straight line.

I understand that this curve is properly termed a "volute," and it is often used in springs. It was also formerly much used in the "fusee" of watch movements, in combination with a chain and a "barrel," to equalize the force of the main spring.

SPECIAL AUTOMOTIVE

Fig. 1—Milling edges of four connecting rods on Cincinnati milling machine. Work raised to cutters by cam at side. Production, 4 rods in 5 min.

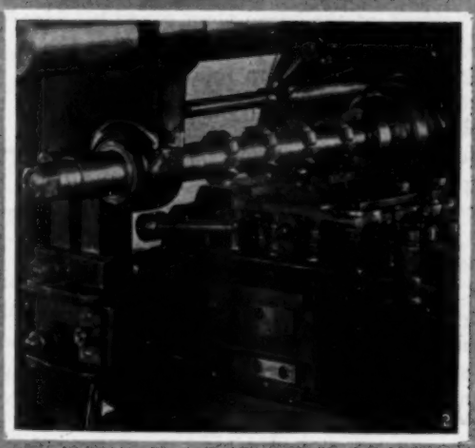


Fig. 2—Channeling four rods on Cincinnati milling machine. Same cam device lifts work to cutters and drops at end of cut. Production, 4 rods in 5 min.

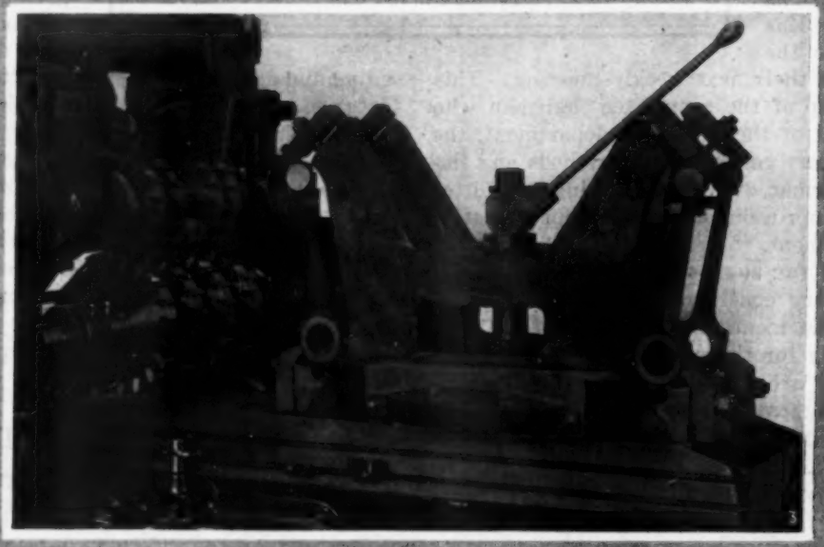


Fig. 3—Facing connecting-rod bosses on double-ended swiveling fixture on Cincinnati milling machine. Mills two rods at each pass. One end loaded while other is in the work. Upper cutters run 38 r.p.m., lower 25 r.p.m. Production time under 2 min. per pair.

MACHINING METHODS

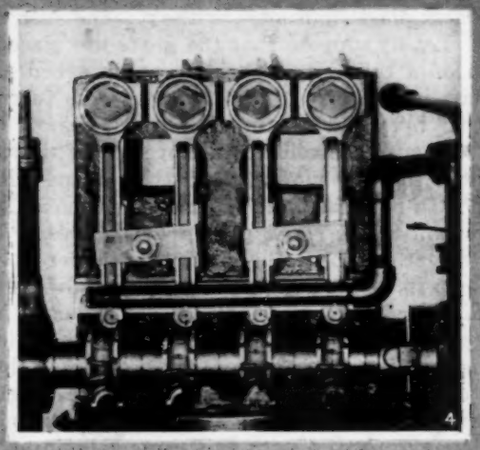


Fig. 4—Rounding small end of rods on Cincinnati milling machine. Work located on studs through finished holes. Production time, 2 min. for 4 rods.

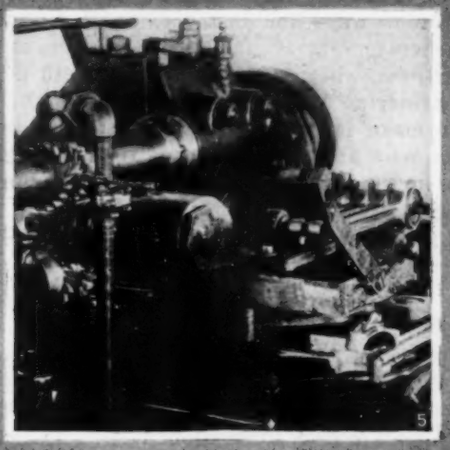


Fig. 5—Splitting cap from rod and milling both lugs. Two sets of cutters. Swiveling fixture carries 3 rods on each end. Production, 80 rods per hour.

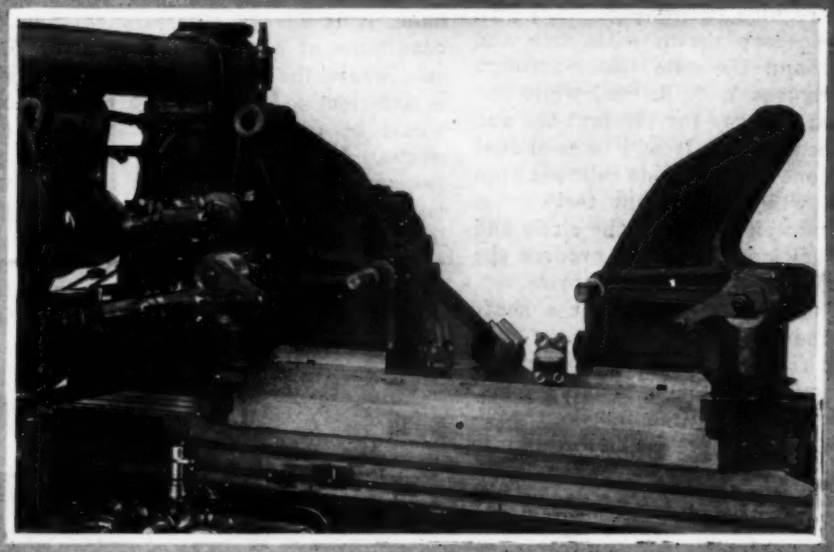


Fig. 6—Milling between lugs on four-bolt rod. Note simple clamps. Swiveling fixture carries two rods at each end. The job is on a Cincinnati milling machine. Production time, 75 rods per hour.

Methods of Machine Tool Design

Second Section of Chapter Dealing With Machine Tool Clutches—Milling of Clutch Teeth—Clutches for Power Presses and Screw Machines

By A. L. DeLEEUW
Consulting Editor, *American Machinist*

CLUTCHES which can be machined on the milling machine should preferably be made with an odd number of teeth. When the clutch is to be made in some different way—for instance, on the Gleason bevel-gear generator—it is immaterial, so far as the manufacturer goes, whether the number of teeth is odd or even. Considering the action of such a clutch it is preferable to make it with an even number of teeth.

The reason why an odd number of teeth should be used for the milling method is that the odd number

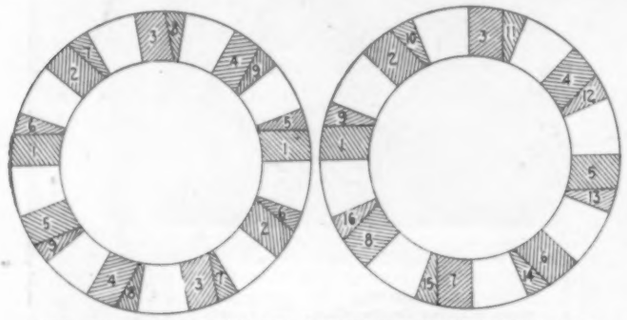


FIG. 127—DIAGRAMS TO ILLUSTRATE METHODS OF CUTTING CLUTCH TEETH BY MILLING

permits the milling cutter to go through from one end of the clutch to the other, so that a clutch with fifteen teeth will require only fifteen cuts, whereas a clutch with fourteen teeth will require twenty-eight cuts. In Fig. 127 two jaw clutches are shown with nine and eight teeth respectively, and the cuts taken through them are indicated by figures 1, 2, 3, etc., while the cut-away parts are shaded one way for the first cut and the other way for the second cut. It will be seen that for the nine-tooth clutch one merely needs to index once clear around the circle, while with eight teeth it is necessary first to index once clear around the circle and then shift the clutch a sufficient amount to produce the desired width of gap, then index around once more.

It is never advisable to slide a clutch over a shaft with only one key, with the exception, of course, of such clutches as may be used for connecting up a crank or handwheel for manual operation of a machine part. The double key is not so much required for the throwing in as for the throwing out of the clutch, because the single key is very apt to cause binding between the clutch and the shaft and make it almost impossible to throw out the clutch under a moderately light load. Even better than the double key is the splined shaft.

In Fig. 128 is shown a clutch construction for a sliding shaft. In this case it is not safe to mount the clutch directly on the shaft, because whether the shaft slides through the gears or the machine element holding the gears slides along the shaft, there will be a tendency to take the clutch along by the friction of shaft or key. To overcome this danger the clutch is keyed to a sleeve which extends from one bevel gear to the other and prevents any endwise motion of these gears. The sleeve itself is keyed to the shaft.

For the author's forthcoming book. All rights reserved.

If the gears themselves serve to give a motion to the member which holds them or to the member which holds the sliding shaft, then it is possible to avoid the above-mentioned difficulty without the use of the sleeve. Let us suppose that the gears are placed at the bottom of a column which slides over a bed and that the shaft is located in the bed; and let us further suppose that by throwing the clutch into gear *A* (on the left), we cause the column to move to the right. Then it is clear that the movement of the column will have a tendency to hold the clutch in mesh. As gear *A* causes a movement to the right, gear *B* must necessarily cause a movement to the left; so that, whether the clutch is thrown in to the right or left, it will always be safe. On the other hand, if the bevel gears are used for some other purpose, so that there may be right-or left-hand movement between gears and shaft, whether the clutch is in one way or the other, then there might be a tendency to throw the clutch out by its movement. Such a case might happen with this same column and bed if the gears were not for moving the column but, for instance, for giving movement to the elevating screw of the saddle on the column.

Though the sleeve construction is not absolutely necessary in some cases, it is advisable to employ it wherever possible. It brings the key for the clutch to a larger diameter. This facilitates the throwing out because the pressure on the key is less. On the other hand, it is always necessary to examine carefully the conditions of each individual case. We might find a case where the maximum possible length of the clutch is sufficient as compared to the size of the shaft, but would be too short as compared to the size of the sleeve. In that case, what we would gain by reduced pressure on the key would be lost by the insufficient length of the clutch, and the shifting might actually become more difficult.

A well-known construction of clutch is that which is permitted to make one or more revolutions after which it is supposed to throw itself out. Such clutches are

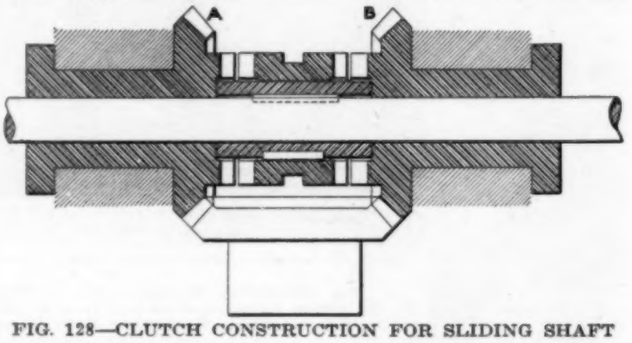


FIG. 128—CLUTCH CONSTRUCTION FOR SLIDING SHAFT

used in power presses, in screw machines, etc. Fig. 129 shows the essential parts of such a clutch. The gear *A* derives its movement from some source and must transmit this movement to gear *B;* or, in general, to shaft *C*. Gear *A* runs loose on the shaft and is constructed with clutch teeth *D*. The clutch *E* is made to mesh with *D* during one revolution. *E* is keyed to the

shaft, so that during that one revolution the shaft also will turn. A spring *F* tends to push clutch *E* into mesh, but is prevented from doing so by an obstruction *G*. This obstruction can be removed either by hand or by some part of the mechanism. This permits the clutch *E* to jump forward and to engage *D*. There is a cam-shaped portion *H* milled in the outer circumference of the clutch which, when bearing up against the obstruction *G*, pulls the clutch out of engagement. All that is necessary then to cause the clutch to make one turn is to withdraw the obstruction for a single moment and let it go back into place. If it should be desired to have the clutch make two or three or more revolutions, some arrangement should be made so that the obstruction cannot go back into place until after the entire number of revolutions but one has been completed.

It should be noticed that, when the clutch is in engagement, there is spring pressure between *B* and *A* and, unless the proper precautions were taken, there would be end pressure against the bearings. To take care of this end pressure, gear *B* bears up against a shoulder of the shaft and gear *A* is limited by a collar *I* pinned or setscrewed to the shaft.

A modified construction of this arrangement is shown in Fig. 130. In this case the clutch is mounted on the hub of one of the gears. This has the advantage of

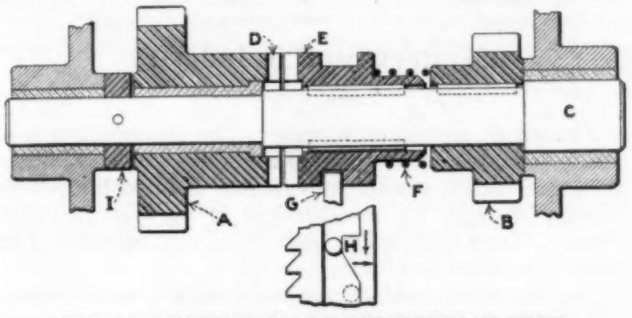


FIG. 129—LAYOUT OF POWER PRESS CLUTCH

being a neater construction, but gives less bearing for the clutch with the same length over all.

It sometimes happens that such a clutch is used in a cycle of operations which requires a very accurate timing. It will be necessary to have the clutch make exactly one revolution—no more, no less. Such a condition might exist in a gear cutter, for instance, if it is used for the indexing. In that case, a construction such as shown in Fig. 131 is used. The cam-shaped groove or projection of the clutch again serves to throw it out of engagement, but there is also a disk on the shaft with a notch in which the projection of a lever fits. For the starting of the clutch both obstructions are lifted out of the way; that is, the one against the cam-shaped portion of the clutch and the one in the notch of the disk. Fig. 131 shows this arrangement. A single movement of the lever *A* operates both levers *B* and *C* and allows the clutch to engage. Lever *B* can return to its starting position, ready to intercept the projection of the clutch, independent of lever *C*. The projection of this latter lever rides on the circumference of disk *D*. When the clutch has made almost one revolution, it is thrown out in the manner described above, but the momentum of the parts permits the shaft to go a small distance further until it is stopped by the projection of lever *B* entering the notch. It happens sometimes that the momentum of a small clutch is not sufficient to overcome the friction which may retard the shaft, so that there would be a certain degree of uncertainty as to whether the projection of lever B will actually enter the notch or not. In that case it is well to make the disk heavy enough to act as a flywheel. Even where the accurate cycle is not required, but where the clutch runs at relatively low speeds, it may be necessary to provide for such a flywheel effect.

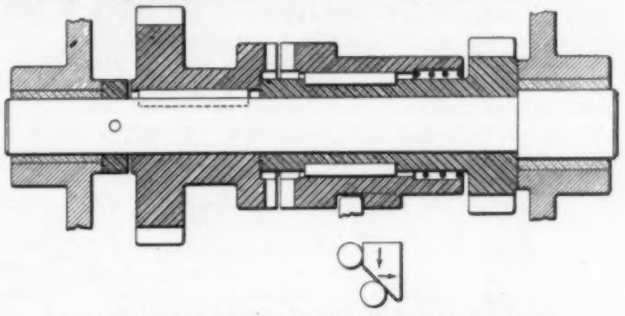


FIG. 130—MODIFIED TYPE OF PRESS CLUTCH

In many cases, more than one revolution of the clutch is required, and this may be combined with the necessity of accurate timing. To accomplish this, two disks are provided, as shown in Fig. 132. These disks are side by side, but are run at different speeds. If, for instance, we should wish five revolutions of the clutch before stopping, we would run disk *B* at one-fifth of the speed of disk *A* and do this by a system of back gearing between *A* and *B*. Disk *A*, which is the slow-running one, would be provided with a notch considerably wider than is required for the projection of the lever but less than one-fifth of the circumference; while disk *A* would have a notch just wide enough to admit the projection of another lever so as to stop it in the correct position. In addition to these two levers, there is a third one which carries the obstruction which holds the clutch out of engagement.

In starting this mechanism, a single movement disengages all three levers. The clutch engages, and both disks begin to turn disk *B* slowly, and *A* as fast as the clutch. Levers *P* and *Q* are in some way connected so that the movement of either of the two must be followed by the other. The two levers, for instance, might both be keyed to shaft *S*. Lever *R* is not connected to the two, though it may be pivoted on the same shaft.

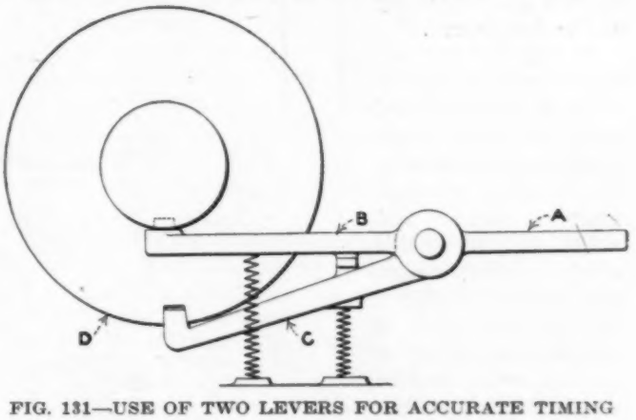


FIG. 131—USE OF TWO LEVERS FOR ACCURATE TIMING

As soon as the handle of the levers is released, they try to resume their original position, but are prevented from doing so by the fact that *Q* rides against the slow-running disk *B*. The lever *R* has a tendency to jump back in the notch of the fast-running disk *A*, but is prevented from doing so by a projection of this lever

which bears up against a similar projection of lever *P*, in the manner shown in Fig. 131. When finally the large notch in the slow-running disk has come far enough, levers *P* and *Q* are permitted to resume their original position. We are now on the last turn of the clutch. The lever *R*, however, cannot yet jump in because it is riding on the circumference of the fast disk. When the last revolution of the clutch is completed, it throws itself out and, immediately after, *R* jumps into the notch of the fast disk.

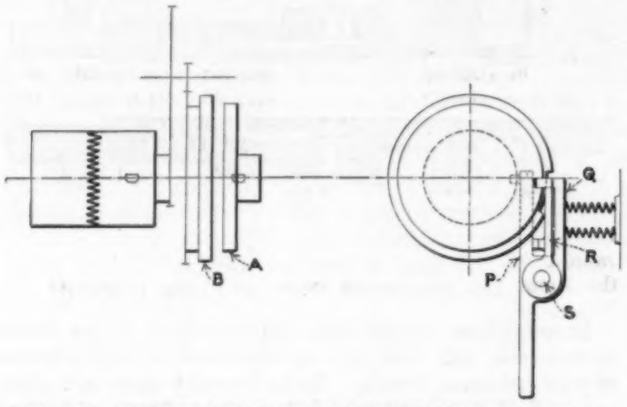


FIG. 132—SKETCH OF CLUTCH PARTS WHERE TWO OR MORE REVOLUTIONS ARE TO BE MADE

When a positive or jaw clutch is used in a mechanism where a certain relation must be maintained, we may find that it is not sufficient merely to use such a clutch but that certain additional provisions must be made. To make it somewhat clearer, we will take a concrete example:

A boring mill is provided with screw-cutting attachment which derives its motion from a vertical feed shaft. The gearing is so arranged that one revolution of the feed shaft will cause the toolbar to move 1 in. There is also a quick traverse arrangement used for returning the toolbar and for its approach to the work. This quick traverse arrangement is driven from a shaft running at constant speed.

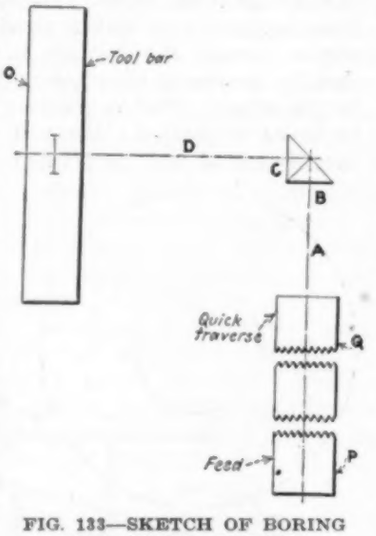


FIG. 133—SKETCH OF BORING MILL SCREW CUTTING ATTACHMENT

In Fig. 133 this arrangement is shown in diagrammatic form. *A* is the shaft which gives the movement to the toolbar through gears *B* and *C* and shaft *D*. It is this shaft *A* which makes one revolution for 1 in. of movement of the toolbar. Shaft *A* derives its motion either from feed box *P* or from quick traverse arrangement *Q*. In order to make sure that the tool point will always have the same relation to the thread to be cut, we must have feed shaft *A* in a certain definite position when the toolbar is raised to a certain point. To speak more definitely, let us say that a chalk mark on shaft *A* must point due north when a mark on the toolbar has been raised to the point *O*. This relation is maintained as long as we use the feed box only, but when we disconnect shaft *A* from the feed box and clutch it to the quick-traverse arrangement, we may get an entirely different relation; nor does this matter so long as we have some means of connecting the feed box to the shaft again in exactly the same manner in which it was connected before.

If the clutch with which we connected the shaft to the feed box has five teeth, then there would be five possibilities, namely, that shaft and box were connected in exactly the same manner as before, or that they would be 72 deg., 144 deg., 216 deg., and 288 deg. away from their proper relation. In order, then, to be absolutely sure that we will regain the original position, we must make the connecting clutch with one tooth only. Such one-tooth clutches are not necessarily clutches on which only one tooth has been cut. They may have more teeth, but one tooth and the mating gap should be larger than all the others so that the two clutches can mate only in one certain position. If we were cutting 5 or 6 or 7 threads to the inch, we might find that the toolbar is 5 or 6 or 7 threads away from the work, but never a fraction of one thread. For $3\frac{1}{2}$ or $4\frac{1}{2}$ or any other number of fractional threads we would need a shaft which moves the toolbar 2 in. per revolution.

Mystery Stuff in Industry

FROM *Power*

The small boy loves a secret; the hidden cave and the mystic password give him endless thrills. When he grows to be a man, he can still indulge himself in similar delights by membership in various fraternal orders. Such membership may be of real benefit to him and do no harm to others.

But the same instinct, combined with a short-sighted view of business relations, has led many a business man to throw the cloak of mystery over his "trade secrets." He does this to keep them from his competitors. Yet in nine cases out of ten they already have the information.

"Experience in dealing with producers of different commodities has shown that secrecy is largely a method by which producers have been fooling themselves," says George Otis Smith, the director of the United States Geological Survey, who has had long contact with production statistics. "Those who really wish to know the scope of competitors' activities have plenty of ways to find out. Secretive operators, who eventually decided to change their methods, have been surprised very much on disclosing their secrets to find that these secrets already were well known to their competitors."

The industries that make the greatest progress are those where co-operation replaces suspicion and where energy is directed into productive channels rather than wasted in the attempt to preserve trade secrets. Manufacturers that co-operate in obtaining and disseminating knowledge of common value find their reward in many ways. Unfair competition grows less as competitors come to know and trust one another. Production costs are reduced to the mutual benefit of producers and consumers. Finally, the good will of the consumer—a matter of first-rate importance—is best fostered by an attitude of frankness in regard to methods of manufacture and distribution. On the other hand, secrecy invariably breeds suspicion.

Effect of German Standardization on Exports

BY OSCAR R. WIKANDER

The following communication to the American Engineering Standards Committee is by an American engineer who has just returned from Germany, where he represented the Committee in conferences concerning the international standardization of ball bearings. Describing the great strides in standardization that have been made by German industries during the last few years, and the important foreign trade advantages accruing to German industries because of their intense standardization activities, he said:

There is no doubt in my mind that one of the main reasons why forward-looking Germans force their standardization work is because they want to introduce German standards in the great importing countries, and possibly in the whole world. Holland, Switzerland, Austria, Sweden, and many other European countries follow the German lead very closely. The great German deliveries in kind to France will no doubt be made as far as feasible according to German standards, thereby introducing them in that country.

It was only a few years ago that the "Normenausschuss der Deutschen Industrie," an organization corresponding to our American Engineering Standards Committee, was formed, but the amount of work which it has already accomplished is stupendous. The Normenausschuss has already issued several hundred sheets of approved standards, and about twice as many are already published as proposed standards. This enormous output of the German organization has led many to believe that it was merely a factory, producing 'paper standards', and that its work was not to be taken very seriously. A personal investigation convinced me that this is not the case, and I found that the great output of standards was merely due to the enormous efforts put forth and to the enthusiasm of the great majority of the interested parties.

This enthusiasm is due to a more or less general recognition, created under the pressure of war conditions, of the great economic value of standardization, and to the very generally accepted opinion that a standardized industry would be one of the strongest weapons in Germany's struggle for economic rehabilitation and financial reconstruction.

To give a concrete illustration of this point, I may mention that at the time of my visit, a syndicate of nineteen German manufacturers and one Swedish manufacturer were executing an order for seven hundred locomotives for Russia, all of the same design, and every part in every one of them was being made interchangeable with the corresponding part in all the others, all parts having been manufactured to the same fits and tolerances. This feature will have the great advantage of permitting the Russian railroads to use any disabled locomotive as a store of spare parts for all the others. In one case a locomotive was assembled from parts machined in twenty different shops, with no more difficulty than a locomotive which was built complete in one shop. In case of future orders, the Russians will no doubt specify that all new locomotives of this class be built not only of the same design as above, but so that every part is interchangeable with the above.

It is easy to realize what great advantages German manufacturers of locomotives will have over those of other nations when competing on the basis of such specifications, and this example illustrates the economic advantage which can be gained by German industry in introducing its standards in all countries importing mechanical equipment.

Another error in our conception of German standardization is the belief that the Normenausschuss is autocratic in its methods and is not in as close contact with the industries as our own standardizing bodies. I found, on the contrary, that absolutely the same methods are used there as here to arrive at national standards. The staff of the Normenausschuss is merely co-ordinating and directing the work of the various committees, and the actual work in establishing standards is left to such experts as are recognized leaders in the various industries.

The Normenausschuss is a big organization built up along the same lines as the American Engineering Standards Committee. Its personnel consists of the same high grade type of men as selected in this country for that kind of work, only there are more of them and their work is greatly facilitated on account of the eager response from the German industry, whose leaders look to standardization as one of their greatest hopes for salvation.

Many of the big German manufacturers have standards departments of their own, with a number of engineers and draftsmen working permanently on national standards. I found the staff of the Normenausschuss greatly interested in American standardization and very anxious to collaborate with us in establishing international standards.

It was proposed that they should send the American Engineering Standards Committee all the drafts of any importance submitted to their own committees for consideration, so as to make it possible for them to obtain American comments on important propositions, which might be of value in making final decisions. It was also suggested that the American Engineering Standards Committee keep the Normenausschuss posted on its more important work. It would, of course, be highly desirable to establish international standards and great efforts are being made to obtain them in certain lines, such as ball bearings.

The days may not be far distant when our manufacturers will receive inquiries from oversea countries to furnish goods according to the German national standards or specifications, as referred to above in connection with the Russian locomotives, and it behooves us to plan in time to meet such conditions. England seems to have realized fully the importance of recognition of her standards, and is trying to force the adoption of them in her colonies and dominions.

On account of its very efficient organizations, the German Standards Committee has come to play a more important role in the industrial life of the nation than originally expected and manufacturers write to the Normenausschuss for advice on questions of the most intricate nature.

In conclusion I wish to express the hope that the example of the German engineers and manufacturers may spur us to make equally large contributions in work and money to the cause of standardization, and that our leading engineers may try to realize the enormous economic importance of both national and international standards.

Can You Drive a Rivet?

BY CHARLES W. LEE

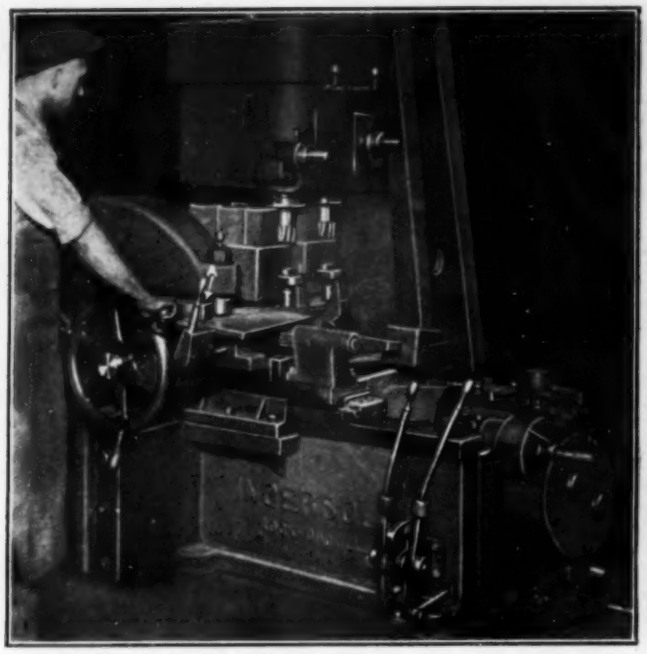
A great many persons who think sloppily when they think at all have an idea that a thing should not be called wrong by one who cannot make it right; or in other words that there should be no criticism by one who cannot find a remedy. This is the reason why the "practical man" so greatly despises the "theoretical man," who in his turn equally despises the practical man, neither realizing that each is necessary to the other.

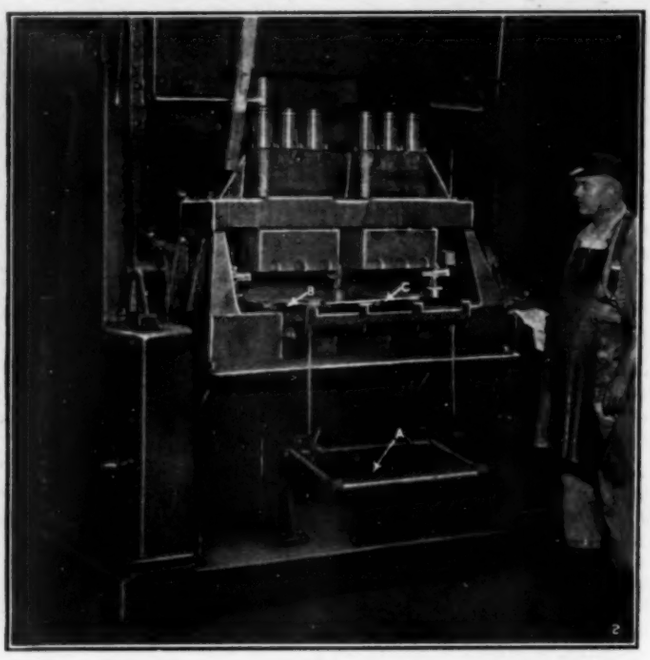
The oftenheard expression, "Oh, that is all right in theory but it will not work out in practice," gets my goat, because a little reflection will show that whatever will not work out in practice is not right in theory, and that a theory is not wrong simply because it cannot be made to work by the one who propounds it.

I heard an old "practical man" with whiskers say to a young man without whiskers who ran a boiler factory and ran it well:

"Say, young fella, can you drive a rivet?"

"No," the young man said, "but I know when a rivet is well driven;" and whiskers shut up. But he had enough good practical common sense to keep right on buying his boilers of the same young man.





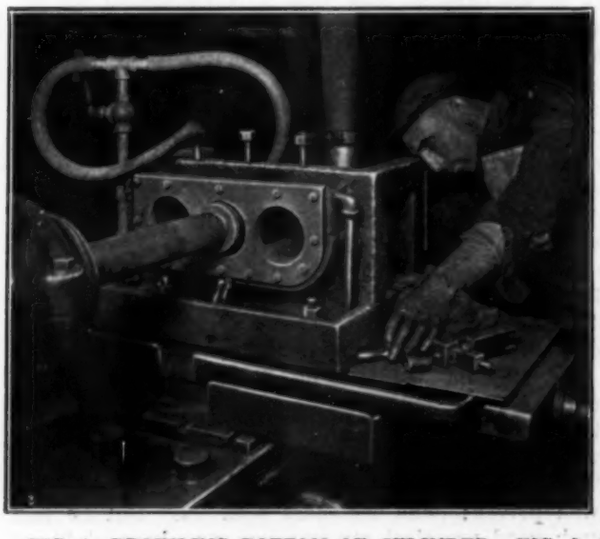
Marmon Methods on Cylinders and Crankcases

Special Machines and Fixtures for Profiling, Milling and Grinding Cylinders—Scraping and Lapping Crankcase Joints—Inspecting After Machining

SPECIAL CORRESPONDENCE

THE cylinders of the Marmon car are cast in blocks of three each, as in the case of the Rolls-Royce and a few other makes. The cylinder blocks are first faced on a Cincinnati milling machine after which they are rough-bored on a combination Beaman & Smith machine. All operations are located from three points on the cylinder block. The bolt holes are then drilled in the flanges and after another drilling and milling operation the cylinder castings are milled on the lower side of the water jacket in an Ingersoll profiling machine which handles two cylinder blocks at once, as can be seen in Fig. 1. The movement of the table is controlled by the form and roller shown at *A*, which guides the profiling cutter around the barrels of the three cylinders, a counterweight taking care of the cross-movement, holding the roll in contact with the form.

The surface thus profiled is used in locating the cylinders for the final boring, as can be seen in the Foote-Burt machine, Fig. 2, where two cylinder blocks, or a complete motor, are bored at one setting. This view shows the way in which the cylinder blocks are held in position by the clamps beneath, the clamps being easily adjusted by the wrench shown. In removing the cylinders, the operator steps on the treadle *A*,



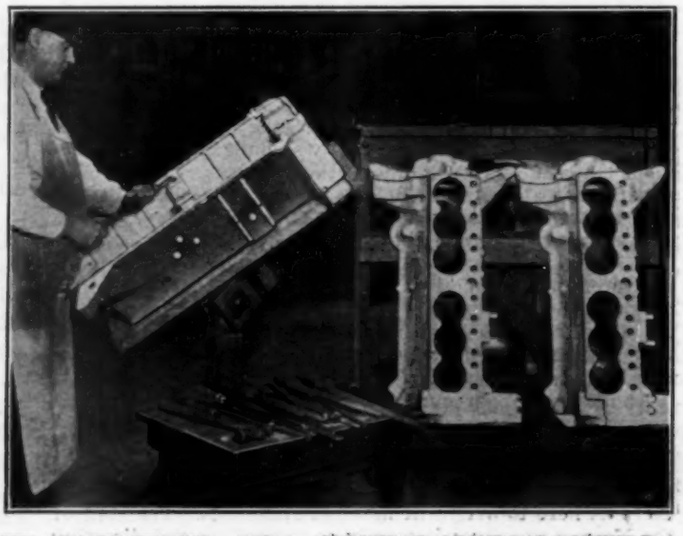


FIG. 1—PROFILING BOTTOM OF CYLINDER. FIG. 2—THE FINISH-BORING. FIG. 3—CYLINDER GRINDING FIXTURE. FIG. 4—CLEANING CRANKCASES

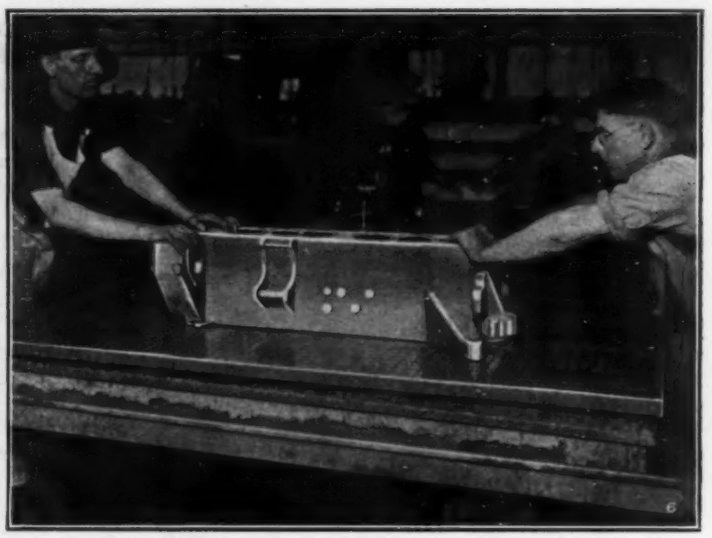


FIG. 5—MILLING UPPER SURFACE. FIG. 6—LAPPING THE JOINT

which raises a supporting pad *B* and *C*, under each cylinder block. The clamps are then released, swung at right-angles so as to allow the cylinder blocks to pass and the work is easily lowered and removed.

There remains only chamfering, counterboring, milling the sides, drilling for spark plug holes, and the water test of 40 lb. The cylinders are then painted, after which they go to the Heald grinding machines for finishing in the bore. Fig. 3 shows the type of grinding fixture used. Provision is made for exhausting the grinding dust and also for running water through the cylinder jacket during the grinding operation. The substantial construction of the grinding fixture helps to insure accuracy and squareness of the bore. Interesting experiments with diamond boring tools have also been made to secure the best cylinder possible.

The first operation on the crankcase is to brush the aluminum casting all over so as to remove any loose material, to smooth off any small snags or projections and in this way prevent the possibility of foreign particles getting into the bearings after the motor is assembled. Fig. 4 shows the special truck which carries four of the crankcases, and also the scraping stand at the left on which they are readily clamped. As can be seen, these stands are readily adjustable so as to make it easy to reach all parts of the crankcase without getting into strained or uncomfortable positions.

Both the crankcases and the oil pans which go under them, are machined on a large Ingersoll milling machine as shown in Fig. 5. In this case the fixtures are also the product of the Ingersoll company whose varied experience makes it possible for it to design fixtures of various kinds for handling work rapidly. As will be seen these fixtures support the outer edges of the lower crankcases against the thrust of the milling cutter so as to prevent breakage or distortion. It will also be noted that supporting strips are cast across the crankcases and stiffen them during the various operations.

Particular attention is paid to securing a perfectly flat surface and an oil-tight joint between the upper and lower crankcases. After being very carefully milled, these surfaces are lapped on the large lapping table shown in Fig. 6. This is a cast-iron table, grooved in both directions so as to present small squares, which prevent the accumulation of the lapping material on the surface of the table itself. A fine abrasive is used and the lapped surface carefully inspected on another plate as shown in Fig. 7.

The inspection of the crankcase is shown in Fig. 8 where gages of two different types are used in checking up the two surfaces to make sure they are parallel in both directions. After lapping, the surface is carefully cleaned to prevent any of the abrasive finding its way from the crankcase surface to the bearings.

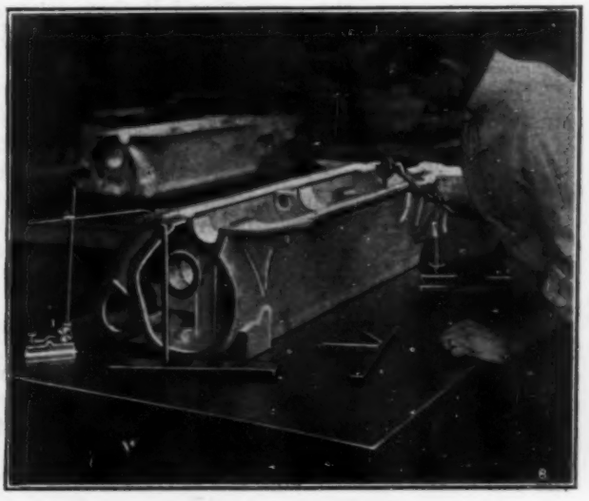


FIG. 7—INSPECTION OF JOINT. FIG. 8—GAGING THE CRANKCASE

A Combination Gage and Adjusting Fixture

BY C. J. DORER

The maintaining of accuracy when riveting and soldering parts together on a production basis is a difficult matter, and the fixture here presented is for work that requires extreme accuracy for alignment and center distance in work of such character.

A number of devices such as the average straightening fixture were used, but with little success. After considerable experiment the fixture shown in Fig. 1 was designed. This fixture makes it possible to not only check the part, but to correct it. The part in this case is shown in Fig. 2 and consists of a ⅜-in. shaft, 10 in. long, to which a sheet metal plate 0.097 in. thick is securely riveted. This plate has two balls formed thereon, which extend outwardly and parallel to the shaft. To this plate is riveted a disk which is also soldered to the outer sides of the two balls.

Prior to being inspected by this gage, the balls and

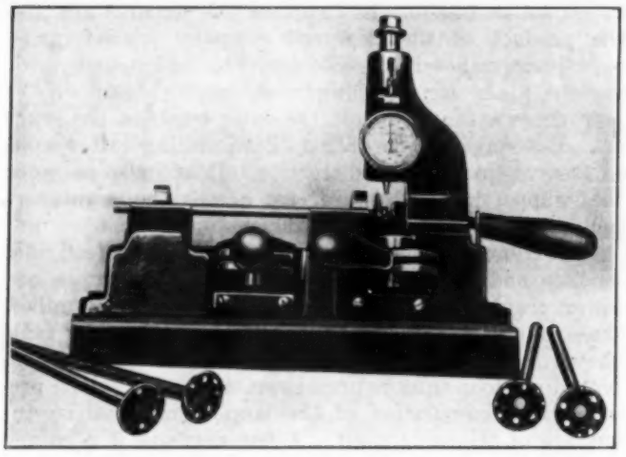


FIG. 1—COMBINATION GAGE AND ADJUSTING FIXTURE

shaft are inspected for center distance. They must be equidistant from a line normal to the shaft. This phase of the checking is taken care of by a different gage.

The gage herein described is used for determining whether the balls are diametrically opposite each other, the shaft being at the center; and if they are not, it is used for adjusting them until they are diametrically opposite each other, within ± 0.001 inch.

There are numerous reasons for the accuracy that must be maintained relative to these balls, as the shuttle of a sewing machine is driven, and consequently, timed by them. The alignment of driver holes in the shuttle with these balls, and in which the balls operate, must be practically perfect. To describe this phase of the driver would be to enter upon an unnecessary description of the very heart of the sewing machine.

PRINCIPLE OF OPERATION

The block 35, Fig. 3, is so made that when placed in the gage its top surface *A'* against which the ball rests, is such as to cause the center of the ball to be at *A* or above the horizontal line *B*. This means that the ball at the opposite side is a corresponding distance below the line *B*. The same holds true as to alignment diametrically when the block has been reground several times. The ball might then rest on the surface *C'* its center being at *C*, which is below line *B*, and therefore the opposite ball would be a corresponding distance above line *B*. Therefore, if the indicator is set at zero by means of the master gage the parts which are placed in the gage will register in a like manner when they are correct, that is, when they are diametrically opposite each other. The indicator will also register the amount of error if there is any. The amount of varia-

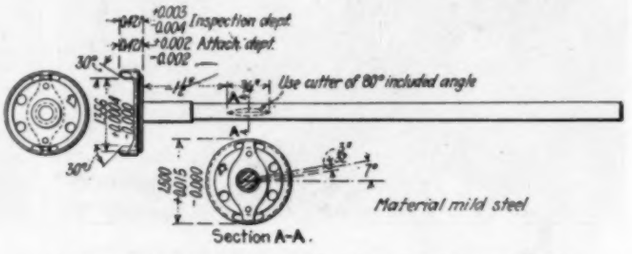


FIG. 2—THE WORK TO BE GAGED AND ALIGNED

tion tolerated in block 35 is between 1/32 to 1/64 in. plus or minus.

It should be noted that this amount of variation in block 35 will produce practically no variation of center distance in the position of the ball relative to the indicator plunger.

It should also be kept in mind that the gage is set to a master before using and that the checking of the parts is a comparative check with the master as a basis.

When the ball which is against or near block 35 is clamped, the rest of the shaft is lying freely in the half bushing as shown. The shaft is then clamped, and in this way no strain is set up between the ball and the shaft at this time. The other ball is then tested, and if the indicator does not register within the limits the ball is forced in the desired direction, up or down. This forcing sets up strains which are released as soon as the clamps are opened and the shaft lies free.

The position of the balls is then reversed and the reading is again taken. The balls will now show more nearly in alignment than before owing to the bending or forcing. If they are not within the limits, the operation can again be repeated, and so on, until the balls are diametrically in line with the center of the shaft.

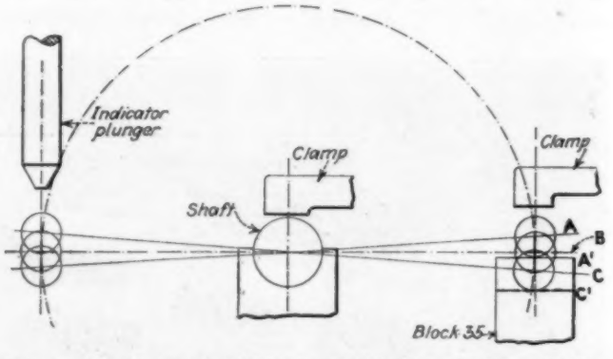


FIG. 3—DIAGRAMS SHOWING PRINCIPLE OF THE GAGE

Occasionally shafts are found which are so far from being correct that they cannot be corrected in the gage. These have to be either re-operated or scrapped.

The reason for reversing the balls after each bending is so that the bending will be equalized to some extent on each side of the center of the shaft. The clamp

must be released after each bending so as to release the strains which are set up between the clamped balls and the clamped shaft.

Method of Operation

The part is laid in the hardened tool steel semi-circular blocks *B* and *C*, Fig. 4, and one of the balls caused to rest upon block *A*. The ball is then held by clamp *D*, after which the shaft proper is clamped by clamps *E*.

It was essential, as this job is on a 100 per cent production basis, to have quick-acting clamps, and therefore cam actuated clamps were used. The clamps, which are operated by a split cam *G*, quickly tighten and release the piece, about 90 deg. of motion being required. The clamps are adjustable and can be rectified by unlocking and turning stud *H*. They are actuated by pin *J*, which rides in a slot in the cam, shown in the left-hand illustration.

Block *A*, against which one of the balls is clamped, wears quite rapidly. A master gage which is practically a duplicate of the part is used to set up the job. By using the master gage it is possible after regrinding block *A*, to reset the indicator.

After the part has been securely clamped, plunger *K* is brought down on the free ball. This is the most delicate part of the gage, as the plunger must come down with enough pressure to insure its being tight against the ball, and still not cause it to be displaced. This was accomplished by the construction shown in the section shown in Fig. 4. A bracket *L* was built and bushed with bushings *M* and *N*. Gaging plunger *K* is placed in a long sleeve *O* in which it has a sliding fit, and is backed up by a spring *P* of proper pressure. Sleeve *O* has a shoulder against which spring *R* presses, holding it up. Pin *S*, which rides in a slot in bracket *L*, prevents sleeve *O* from coming out. Plunger *K* is also provided with a stop pin *T* which rides in a slot in sleeve *O*, a clearance slot being provided in bracket *L*. Pin *T* also engages the indicator bar and registers the accuracy of the part.

The action of these parts is as follows: As sleeve *O* is pushed down, it in turn, through spring *P*, gently pushes plunger *K* down until the plunger strikes against the part and registers the error on the indicator. The operator continues to press down on sleeve *O* until the head of the sleeve strikes the top of the bracket. About $\frac{1}{16}$ in. of motion is required to bring sleeve *O* to a stop after plunger *K* strikes the ball. Therefore, it makes little difference how hard the operator presses on sleeve *O* as the pressure of plunger *K* on the work will always be the same if the sleeve is pushed all the way down. Also, spring *P* is always compressed the same amount, the same holding true for spring *R*.

Correcting the Reading

After taking the reading, if the location of the ball is not within the limits, which are ± 0.001 in., the operator can correct it by means of lever *V*. This lever is fulcrumed on a screw and is provided with a slot so that it can be slid in and out. The ball engaging end is provided with a hole which encircles the ball. By means of this lever the operator can gently bend the part in the desired direction. After bending, the piece must be reversed so that the other ball is brought under the indicator. The second ball is then tested in the same manner. The average part can be tested and brought within the limits with two or three attempts.

It is not necessary to release the part after each bending operation, as the strains which are set up in the metal are not released until the clamps are opened. An experienced operator can quickly bring both balls and shaft into alignment very quickly.

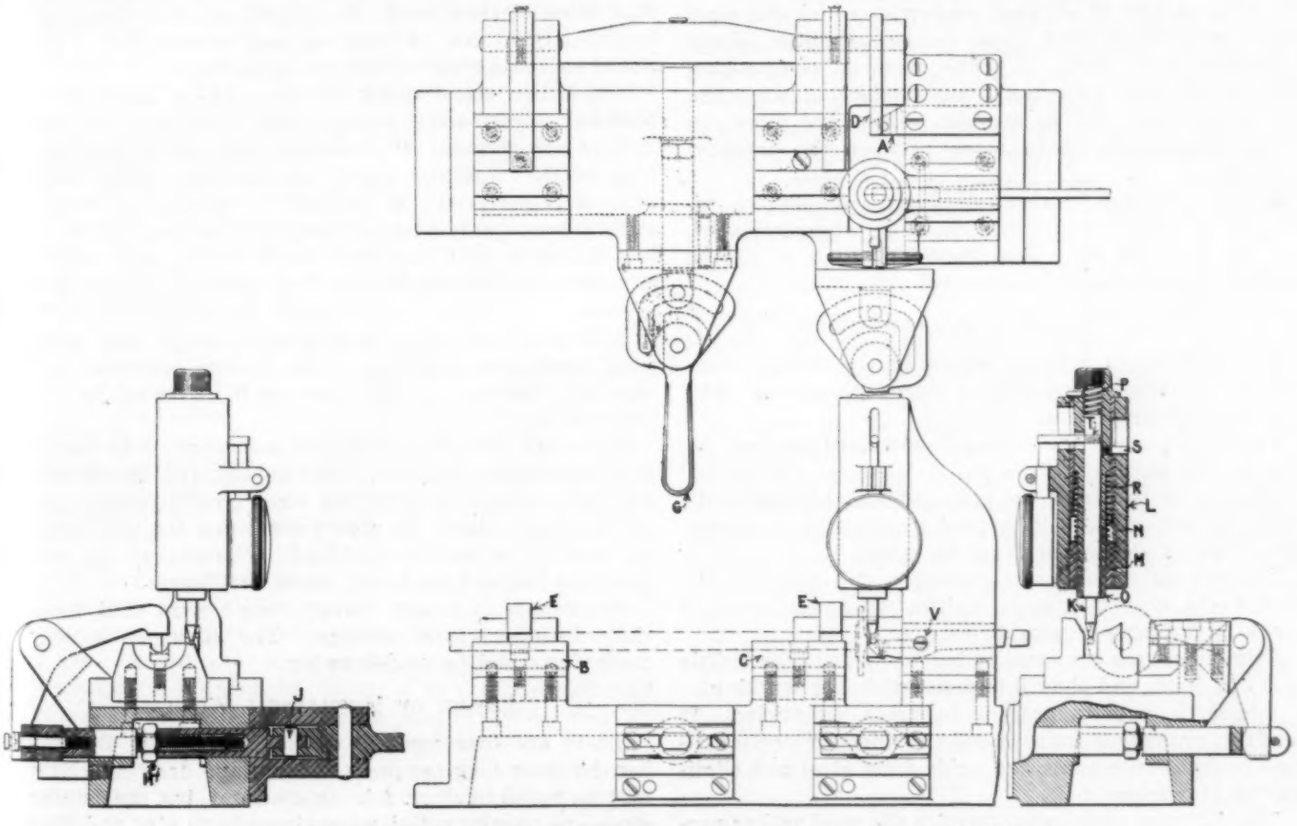


FIG. 4—DETAILS OF COMBINATION GAGE AND ADJUSTING FIXTURE

Treatment of Carbon Steels

What Various Chemical Compositions and Treatments in Steel Making Produce—Properties and Uses of Some Steels—Methods of Working

By DEAN HARVEY

THE enormous variety of applications of steel products in practically all of the industries has made it necessary to develop many grades of steel covering a wide range of physical properties, in order to obtain materials best suited to each use. The steel maker has produced steels differing greatly in strength, ductility and hardness, by varying the chemical composition of the steel, and also by changing the character and extent of its mechanical working and of its heat-treatment during manufacture. The user has greatly improved the essential characteristics by further heat-treatment.

The selection of the proper grade of steel for any application is important in order to obtain the greatest efficiency by a combination of quality and cost which gives the material the properties best suited to that application.

The chemical compositions of some of the commonly used grades of steel bars are shown in Table I. The wide variety of physical properties which the steel maker may obtain with these grades of carbon steels is illustrated in Table II. The chemical composition and the physical properties vary somewhat with the size of the bar, and so average values are given, to enable comparisons to be made between the different materials.

Higher strength, increased toughness, greater resistance to shock, and other desirable characteristics, may be obtained by proper heat-treatment of carbon steels or by the use of heat-treated alloy steels.

DIFFERENT characteristics are given to carbon steel by changing the chemical composition, the mechanical working and the heat-treatment in manufacture.

Strength, hardness, toughness, ductility, resistance to shock and brittleness may be increased or decreased by varying the chemical content.

Hot working breaks up the crystals and improves the soundness of steel by closing the blowholes.

Cold working increases the hardness and strength and gives accuracy in size.

Effect of Chemical Composition

The addition of a small percentage of carbon, manganese, phosphorus, sulphur or silicon gives steel various physical properties.

Carbon increases the strength and hardness but decreases the ductility.

Manganese increases the strength and hardness. In ordinary carbon steel it is used principally to remove the oxygen and sulphur from the steel.

Phosphorus reduces the ductility and renders the steel "cold short," that is, brittle when subjected to shock at ordinary temperatures.

Sulphur causes the steel to be "red short," or brittle at a red heat, and thus interferes with hot working.

Silicon is usually present in small quantities. It tends to promote soundness and provides greater toughness by removing gases and oxide from steel and eliminating blowholes.

The different physical properties the steel maker produces in the grades of steel given in Tables I and II make them adaptable to different uses. It is of interest to note the principal factors which accomplish these results.

Rivet steel is soft, tough and very ductile. The low carbon and manganese content causes low tensile strength and high ductility, while the toughness and ductility are increased by keeping the phosphorus and sulphur content low. Cold-drawn bessemer screw stock is used for high-speed screw machine work. For free cutting at high speed, the steel must be brittle, and this brittleness is obtained by adding both phosphorus and sulphur. The required close accuracy of dimensions is secured by cold drawing which also considerably increases the strength. This steel costs considerably more than hot-rolled steel, due to the cost of the cold drawing operation.

Open-hearth low carbon steel is soft, tough and ductile. The strength is greater and ductility lower than those of rivet steel. It is used especially where a tough, ductile steel is required, and where rivet steel would be too ductile or not strong enough.

Cold-drawn open-hearth screw stock is similar to bessemer screw stock, except that it is made by the open-hearth process. It is tougher and not as free cutting as the bessemer steel, but machines fairly well even at high speed. It is used for screws and other applications where greater toughness is required than is obtainable with bessemer screw stock, and where accuracy of dimensions and free cutting quality are needed.

Cold-rolled axle steel is a strong, tough steel with good machining qualities. The tensile strength and especially the elastic limit are much increased by the cold-rolling.

Hot-rolled axle steel is strong and tough, with fairly good machining qualities. The carbon and manganese are high enough to give the steel good strength, yet low enough to keep the steel from being too brittle, or too hard to be readily machined. Phosphorus and sulphur are low and so do not cause brittleness.

Music wire is a very strong, tough wire used especially in pianos and springs. The strength is very much increased by cold-drawing.

Effect of Mechanical Work

There are four methods of working steel: By rolling, hammer forging, press forging and drawing. Bars may be rolled to about $\frac{1}{2}$ in. in diameter, but the smaller sizes are usually rolled approximately to size and then finished by cold drawing through a die. For bars

larger than 7 in. in diameter, forgings are often used instead of rolled bars, in order to obtain more thorough working of the steel.

Hammer forging requires in proportion a greater pressure than rolling or press forging, due to the shorter time of application, and the effect is not likely to extend as far below the surface of the piece.

TABLE I—CHEMICAL COMPOSITION

Grade of Steel	Carbon % (Approx.)	Manganese %	Phosphorus %	Sulphur %
Rivet steel	0.08 to 0.15	0.30 to 0.50	0.04 max.	0.045 max.
Cold-drawn Bessemer screw stock	0.08 to 0.16	0.60 to 0.80	0.09 to 0.13	0.075 to 0.15
Open hearth low carbon steel	0.10 to 0.20	0.40 to 0.70	0.04 max.	0.05 max.
Cold-drawn open hearth screw stock	0.15 to 0.25	0.60 to 0.90	0.06 max.	0.075 to 0.15
Cold-rolled axle steel	0.30 to 0.40	0.40 to 0.80	0.05 max.	0.05 max.
Hot-rolled axle steel	0.35 to 0.50	0.40 to 0.70	0.05 max.	0.06 max.
Music wire	0.90 to 1.10	0.30 to 0.50	0.025 max.	0.025 max.

Press forging, in which the piece is struck a blow and the pressure is continued, is best adapted for the working of large pieces. The slow action allows the metal to flow, causing the entire mass to be worked. The pressure may be either continuous or intermittent.

Drawing, or passing the steel through a die, is more often used for obtaining accuracy of dimensions than for working the steel, except in the case of steel wire.

The physical properties may be largely affected by mechanical working of the steel. Hot working, by either forging or rolling, tends to improve the soundness of the steel by closing up blowholes. It also breaks up the crystals and removes the cleavage planes along which failure would take place.

The important consideration is to obtain thorough working of the steel throughout its entire mass, so that it will have uniformly high strength because the steel is sound and has small crystal structure. The method of obtaining this result is of secondary importance.

The work should be continued until the steel has cooled well below the critical temperature, in order to prevent large crystals from forming again. The critical temperatures are those at which physical changes take place in the steel. These changes are indicated by liberation of heat during cooling and absorption of heat during heating of the steel, thus retarding the cooling or heating. The temperature at which the working of the steel is stopped has much to do with the physical properties. Steel which has been worked considerably below the critical temperature has a much higher elastic limit than steel the working of which was discontinued at a high temperature.

TABLE II—TENSION TEST

Grade of Steel	Tensile Strength Lb. Per Sq.In.	Yield Point Lb. Per Sq.In. (Minimum)	Elongation In 2 In.; Per Cent (Minimum)
Rivet steel	45,000 to 55,000	23,000	34
Cold-drawn Bessemer screw stock	80,000 to 95,000	70,000*	10
Open hearth low carbon-steel	55,000 to 70,000	28,000	20
Cold-drawn open hearth screw stock	75,000 to 90,000	65,000*	12
Cold-rolled axle steel	80,000 to 95,000	70,000*	8
Hot-rolled axle steel	75,000 to 90,000	40,000	18
Music wire	300,000 to 330,000	250,000	..

* Elastic limit.

By elastic limit is meant the greatest load per unit of original cross-section which does not produce a permanent set. It is lower than the yield point which is the load per unit of original cross-section at which a marked stretching of the specimen occurs without increase of load, and which is usually determined by the drop of the beam of the testing machine.

Cold working, or straining the cold metal beyond the elastic limit causes permanent deformation of the crystals, with increase in the hardness and strength of the steel. The tensile strength may be increased 20 to 40 per cent and the elastic limit 60 to 100 per cent by cold working.

Cold working may be beneficial or harmful depending upon the manner in which it is done, and upon the use to which the steel is to be put. Unequal working, causing internal strains may result in season cracks in service. Large reduction in section of the piece during one pass through the rolls or through the die should be avoided, as this is likely to produce cracks. It is preferable to obtain the desired dimensions by several successive reductions in section rather than to obtain this result in one operation. This applies to both hot and cold working. Excessive cold working may cause the splitting of the steel.

Cold working is generally used for its effect upon the physical properties of the steel, to obtain accuracy of size or to produce complicated sections which could not be obtained in any other way commercially.

Putting Limits on All Dimensions—Discussion

BY M. E. DUGGAN

Mr. Gregory says on page 848, Vol. 56 of *American Machinist*, "In all shops there is a standard of workmanship which is what might be called an unwritten code, and it *should not take a new man long to become acquainted with that standard.*" Suppose we lend the new man a little assistance, that he may become acquainted with the "standard," the "unwritten code," in the shortest time possible, because during the time he is getting acquainted with the shop methods and standards, mistakes—or what would be considered in this particular shop to be mistakes—might show up when the final checking of the job is done.

Showing to the patternmaker, after he has finished making a pattern for a piece complicated in design, a card having on the back the record and time limit for making this pattern, is just so much "bunk." A short talk between the foreman and the patternmaker before the job is started, is the best kind of time-limit record.

I have worked in the pattern shop of a large concern where everything was done on the time-limit system. The new man just starting to work would be given a pattern to make upon which the time limit was set by a journeyman who had been a patternmaker in the employ of this company fourteen years, and as he said himself, "he knew the number of nails in the pattern-shop floor." During my employment with this company in their pattern shop, I don't remember ever having a drawing or job explained to me by the foreman patternmaker.

I do remember getting "hell" from him several times, *after the pattern was made*, because of some trifling mistake that would not have happened had the job or drawing been explained to me at the start. I have seen a pattern with a ten-day time limit in this shop, made in seven and one-half days in another shop.

A new man just starting to work would be told by his friend that six days was the time limit on the job he was about to make. When he had finished he would learn to his sorrow that five, not six days was the time limit and that his "friend" had given him a "bum steer." A time limit is a hindrance rather than an aid to the man who does not understand his job right from the start.

An Up-to-Date Bar Storage Rack

Bars Can Be Loaded Into Rack Directly from the Cars—Ease of Access for Withdrawing Stock for Manufacture

By FRED H. COLVIN
Editor, *American Machinist*

THE quantity of bar stock used in a large automobile gear cutting plant runs into very heavy tonnage. The design and construction of the storage rack of The Central Gear Works, Detroit, Mich., is unusually convenient and has much to commend it. The stock is received from the spur track which runs beside the shipping platform, the outside of the rack being shown in Fig. 1. The bar stock is handled direct from the freight cars into the racks, the bars being segregated according to size.

The rack is open on the other side from the platform into the shop itself, as shown in Figs. 2 and 3. Each side is provided with a rolling steel curtain so that the men in the shop need not be exposed to the cold when the rack is being either filled or emptied. On the other hand, both curtains can be raised at once, allowing ventilation through the rack, should it be desirable in extremely hot weather.

Details of construction of the rack can be seen in Fig. 2. The rack is 90 ft. long and 14 ft. 2 in. high. The openings are about 21 in. wide and 31¼ in. high in the clear, with the openings in the lower part slightly less in height. There are 195 openings in the racks which are accessible from the outside and 24 blanked at the outer end by the supporting columns with an opening on the inside. These short compartments can be used for storing pieces that have been cut off.

The racks hold 20-ft. bars with sufficient clearance at each end. They have a very convenient means of determining how far the bars are to be pushed through when unloading from the car, so as allow the inside steel

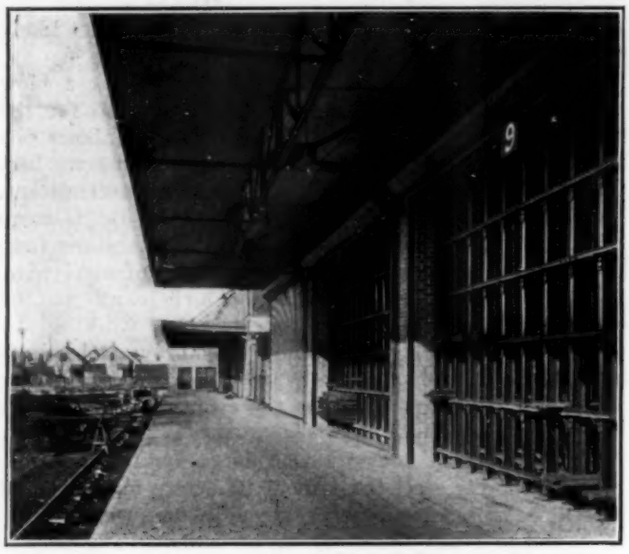


FIG. 1—OUTSIDE OF THE RACK FROM RECEIVING PLATFORM

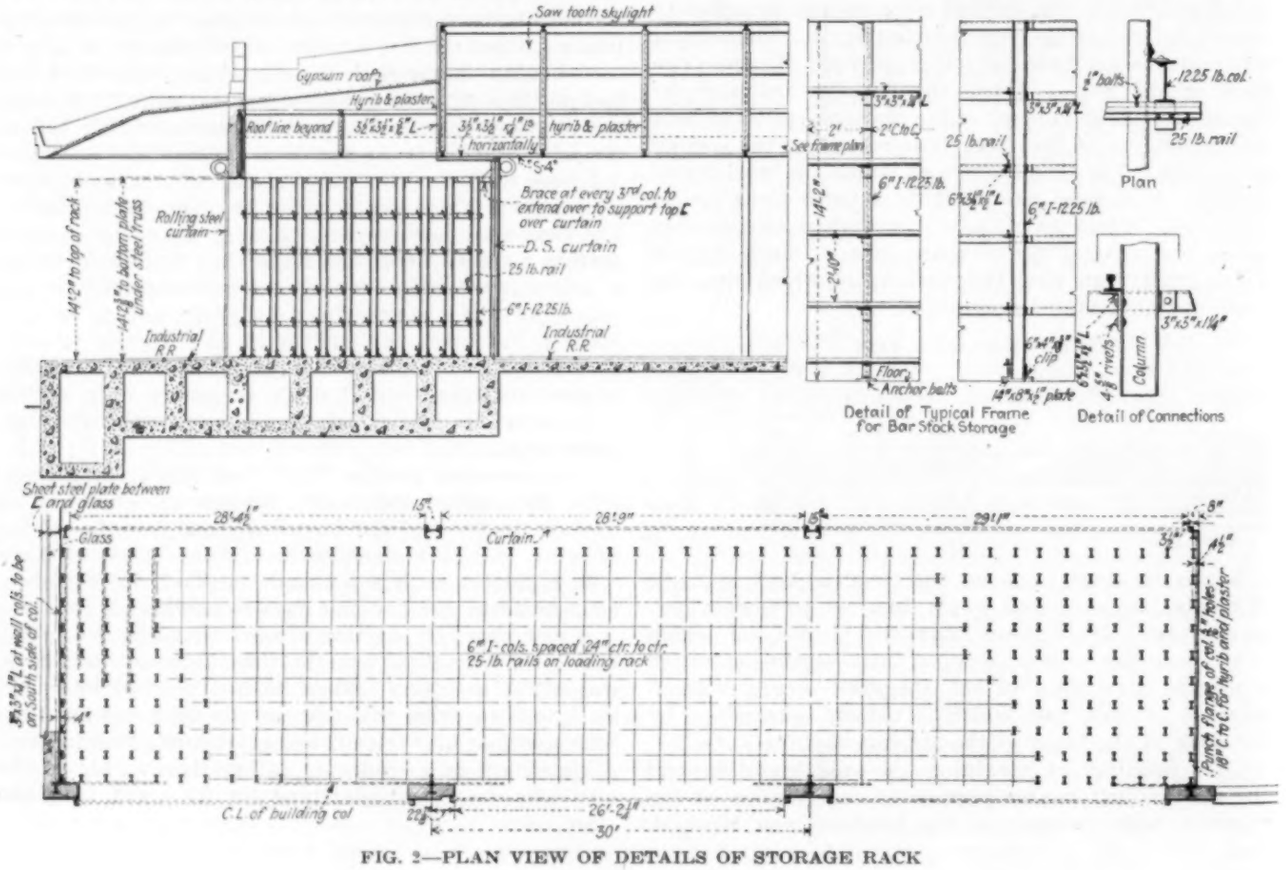


FIG. 2—PLAN VIEW OF DETAILS OF STORAGE RACK

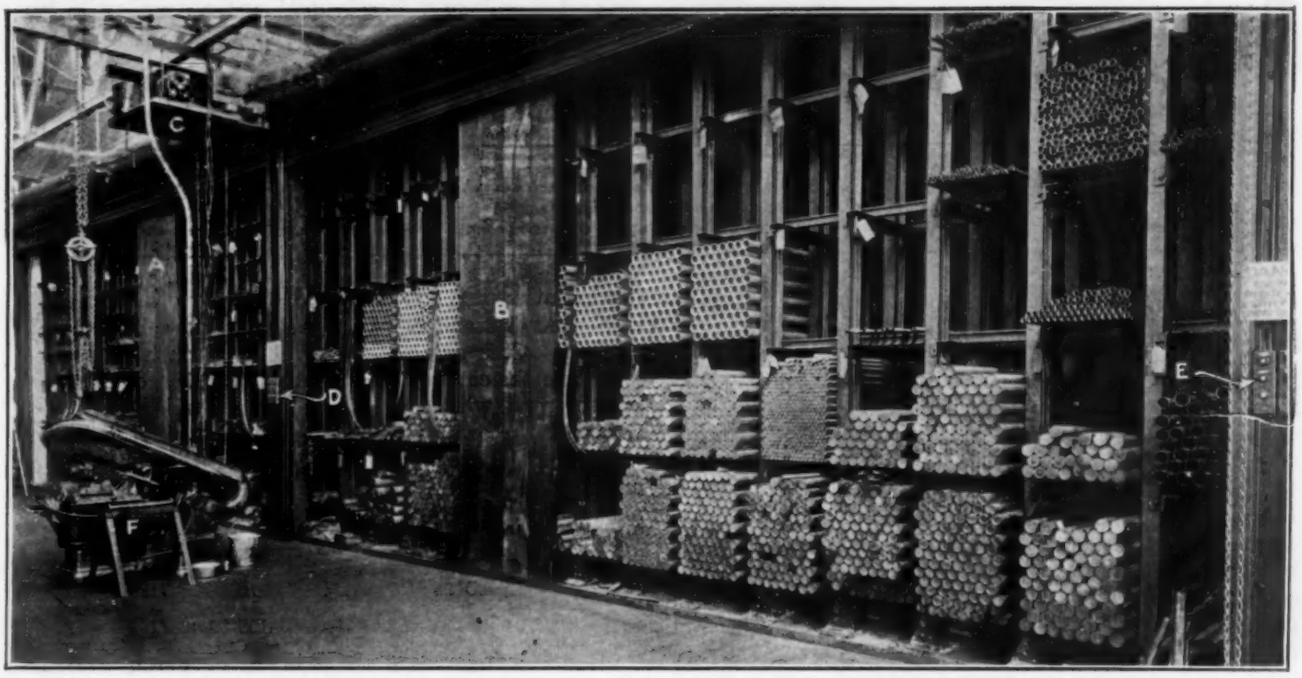


FIG. 3—SHOP SIDE OF THE RACK, SHOWING STOCK IN PLACE

curtains to be rolled down, to permit the closing of the curtains on the shipping platform side, and to enable the workmen to reach the stock conveniently. This device can be seen in Fig. 3.

Each of the three sections has two loading gages in the shape of heavy plank stops, one inside the shop and the other outside at the shipping platform. The outside gages are shown at *A* and *B*, Fig. 3. Each gage hangs on suitable rollers and is supported at both top and bottom in substantial runways. When any particular bin is to be loaded, the plank stop is placed in front of that bin on the inside end. Men working on the platform simply push the long bar through until it touches the stop and then pull the bar back a half inch or so to give the necessary clearance.

The steel curtains are operated by a motor located at *C* and controlled by push buttons at *D* and *E*. These buttons enable the operator to raise or lower any one of the steel curtains without manual labor, adding materially to the convenience and up-to-dateness of this type of storage rack.

A chain hoist is provided for aiding in handling long bars when necessary. Bars can be removed from the racks and cut up on the Napier band saw shown at *F* whenever the work in hand makes it desirable. It will be noted that each bin carries a tag designating the contents of the bin. A running inventory is kept which makes stock-taking an easy matter.

All necessary details used in the construction of the rack are shown in Fig. 2, and it certainly has much to commend it. Those who are contemplating installing storage racks, or whose present equipment is inadequate, cannot do better than to study this rack from its various angles.

Negative Nepotism

BY CHARLES W. LEE

A certain "Old Man" of beloved memory, who was boss of the whole works, had a son Jim learning the trade in the machine shop department.

The foundation walls of the machine shop were washed by a river, which normally flowed by, but rose every spring and flowed in and washed the lower floor—which, however, has nothing to do with the story, but may help to identify the place if the reader is curious.

One day Jim was leaning out of a window and fishing in the river; and another apprentice boy on the floor above happened to see Jim, and let him have, so to speak, the entire contents of a water bucket. So Jim counted the windows from the end of the room, went upstairs, counted the same number of windows, and easily found a boy who looked rather guilty.

Then he went down to the Old Man's office.

"Say, Dad, Bill Jenkins up on number three floor poured a bucket of water all over me!"

"How could that happen?"

"Oh, I was leaning out of the window."

"Why were you leaning out of the window?"

"Oh—well—I was just fishing a little while my lathe was running."

The Old Man was very busy, being much occupied, as usual, with matters of finance and general management, as it was a large works; but he left several pressing things waiting while he hurried up to number three floor to establish the identity of one Bill Jenkins.

The identity of Bill Jenkins having been established, the Old Man went to him, and said,

"Are you Bill Jenkins?"

"Y-y-yessir," said Bill.

"Did you douse Jim with a bucket of water?"

"Y-y-y-e-es sir."

The Old Man put his hand in his pocket:

"You did a good job, and here is half a dollar to douse him again next time you catch him fishing out of the window."

Then the Old Man returned to his regular job of financiering and general managing. The reader may supply his own moral.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Casting Rod Packing in a Railroad Shop

By I. B. Rich

The use of soft metal packing on air brake pump rods and similar apparatus has developed some interesting methods of casting the rings in various railroad shops. The molds and methods used by the New York, New Haven & Hartford Railroad are shown in Figs. 1 and 2.

One of the molds is shown in Fig. 1 with some of the rings removed. It does not, however, show the coned ends on the rings already in the mold. The mold proper is the heavy cast-iron plate *A* which is bored for twelve rings of different kinds. The cores *B* are placed in the molds, the cover *C* lowered and the metal poured through the small gates represented by the small round white dots in the upper plate. The sprues have a sharp taper so as to be easily pushed out from the under side of *C* after they are cut off.

After the molds are all poured the bar *D*, which is removed from the cover as soon as it is lowered for pouring, is placed in the stud *E*, which is mounted eccentrically. A partial revolution of this stud slides the cover plate endwise and shears off all the sprues at one movement. The bar is then placed in the mold cover and used to raise it as shown. It will be noted that some of the cores have a projection on one side which makes a split in the cast ring, while others leave the rings solid. Also that the cores have a crossbar on the inside so that they can be easily handled in and out of the molds.

A similar but larger mold is shown in Fig. 2. In fact this is one of a battery of four molds permanently arranged on a heavy truck so that it can be run in front of the melting furnace when it is to be used. These molds are for larger rings but the method used is the same as in the first case. The four molds are mounted at an angle and all have their covers connected to a central stand equipped with pulleys and counterweights. This arrangement makes it much more easy to handle the covers, and in fact something of this sort is necessary with molds as large as this. This view shows the allowance for end movement in the hinges which takes care of the shearing of the gates. The method of stringing the cast rings on wooden sticks, is shown in front of the mold.

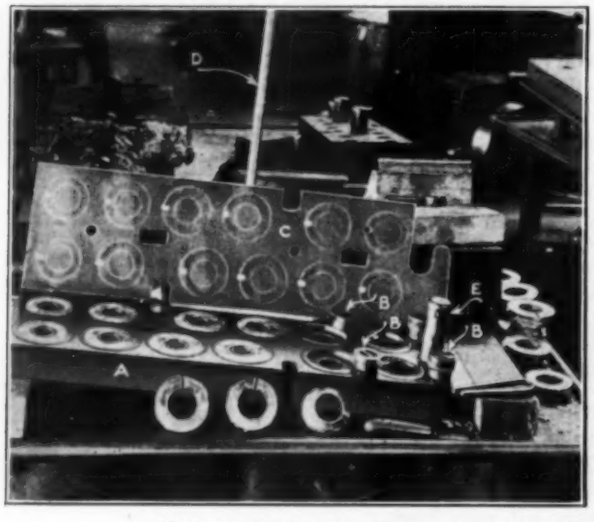
The Necessity of Clean Oil

By Frank C. Hudson

My letter regarding the scoring of motor bearings where a forced feed is used (*American Machinist*, Vol. 56, page 919), seems to have stirred up a healthy discussion. Regardless of the merits of the two systems, splash or forced feed, there can be no question as to the cause of the scoring being grit and other impurities in the oil. The one answer seems to be to keep the oil free from these impurities, either by suitable filters in the oiling system, if that be possible, or by removing the oil, cleaning it and using it over, with perhaps the addition of some new oil.

Installations of apparatus for purifying oil are becoming more numerous in large machine establishments, but are usually out of the reach of small shops, not to mention motorists. Oil reclaiming plants would seem to be a possibility in many localities, but they would require a high type of honest and careful operation to be of real value. It is difficult to imagine a business where carelessness or the slightest lapse from the straight and narrow path of strict honesty, would do more harm or be more difficult to detect.

Clean oil and enough of it is a necessity, which, to the small users, means frequent emptying of the old oil and refilling with new oil.



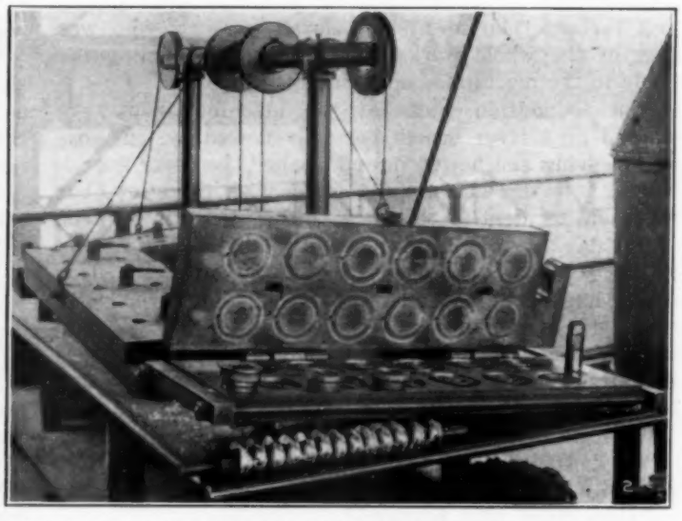
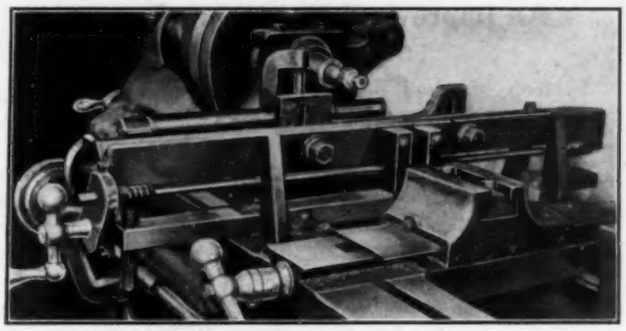


FIG. 1—MOLD FOR CASTING PACKING RINGS. FIG. 2—FOUR LARGER MOLDS ON TRUCK

Milling Seats for Woodruff Keys in a Lathe

By Robert Brainard

The keyseating attachment shown herewith is in operation in a small machine shop in Wisconsin. It consists of a long V-block with three bearings for a worm shaft. The three worms carried by the shaft drive three worm gears that turn three large screws threaded into a heavy block that is bolted to the carriage. Perpendicular guiding is provided by castings



ATTACHMENT FOR MILLING SEATS FOR WOODRUFF KEYS IN A LATHE

bolted to the carriage. The worms are operated through spur gear and pinion by means of the ball crank handle.

The V-block is used to support large shafts but small shafts are held in a smaller V-block bolted to the side of the larger block. In the illustration a shaft is in position in the smaller block. In either case clamping is done by the C-clamp.

Three Planing Jobs in a Railroad Shop

By Herbert Crawford

The guides on the back heads of steam chests on locomotives fitted with Walschaert valve gears are difficult things to plane without the use of special holding fixtures.

At the Readville, Mass., shops of the New York, New Haven & Hartford Railroad the fixture shown in Fig. 1 is used. The hole for the valve stem is first drilled in the head, a special holding fixture being used. The head is then mounted on a mandrel and faced in a lathe, after which the stud holes are drilled.

The work then goes to a Woodward & Powell planer

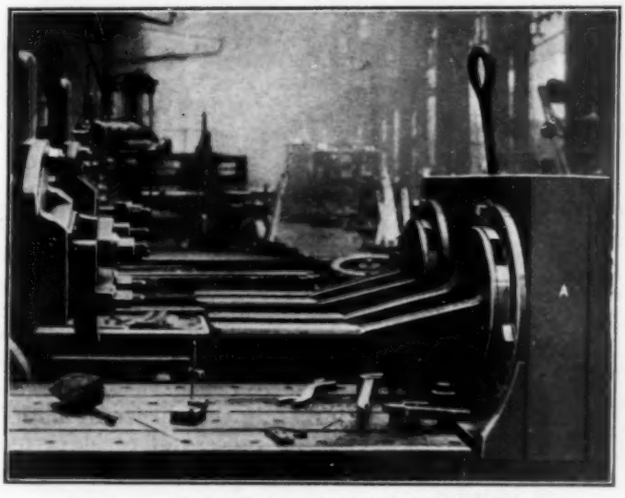


FIG. 1—PLANING GUIDES ON STEAM-CHEST

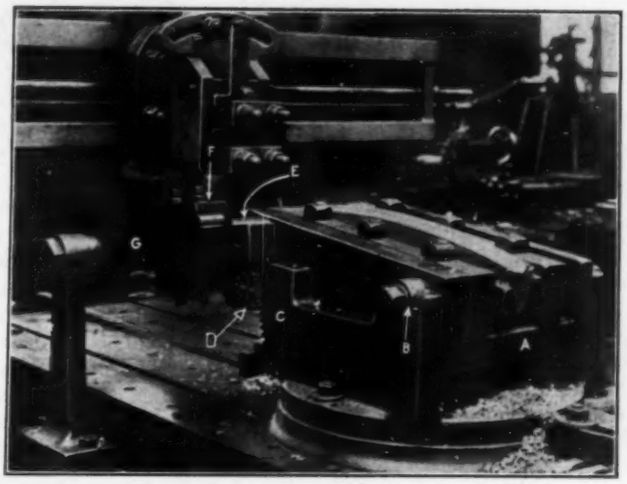


FIG. 2—A RADIUS PLANING DEVICE

which is fitted with a substantial fixture as at *A*, with dowels to locate the heads so that the guides will be level and in planing position. The fixture holds two steam-chest heads so as to utilize both heads of the planer and makes it possible to plane the steam chest heads at a considerable saving of time over the older method.

There are many devices for planing locomotive valve motion links and link blocks. The one used in this shop is shown in Fig. 2. It consists of a chuck body *A* which holds the work and is pivoted at *B*. The frame or base in which the chuck swings has a gear segment on each side at *C* into which mesh pinions as at *D*.

At the back end of the chuck the trunnion carries the jaw *F* which fits over the inclined bar *G*. The angle

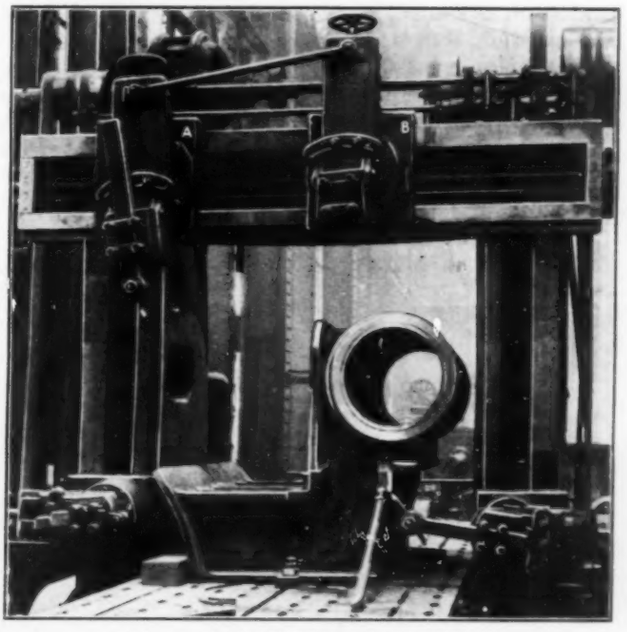


FIG. 3—A CYLINDER PLANING JOB

to which this bar is set determines the amount of movement of the chuck and with it, the radius of the link. As the planer table moves back and forth the jaw *F* slides up and down the inclined bar and moves the chuck up and down, swinging it from the pivot.

A typical railroad shop job is shown in Fig. 3, which gives an idea as to why machining time is not always as rapid as we would expect on regular work. The

shape of the locomotive half-saddle makes it a very awkward piece to handle and no one can expect good planing time when the tool must be set as shown, to reach up underneath the cylinder to plane a seat for the frame. There is still much to be learned in the design of locomotive parts so that they can be more easily machined.

The connection between the two heads on the upper rail is for planing the radius in the saddle where the boiler fits. The head *A* is clamped to the rail in the proper position and the screws which fasten the swiveling part of the head loosened sufficiently to allow it to turn easily. The feed of the other head *B* is then thrown in so as to travel to the left. The connecting bar swivels the stationary head to the left and swings the tool through an arc, the radius of which depends on the distance from the point of the tool to the center of the swivel.

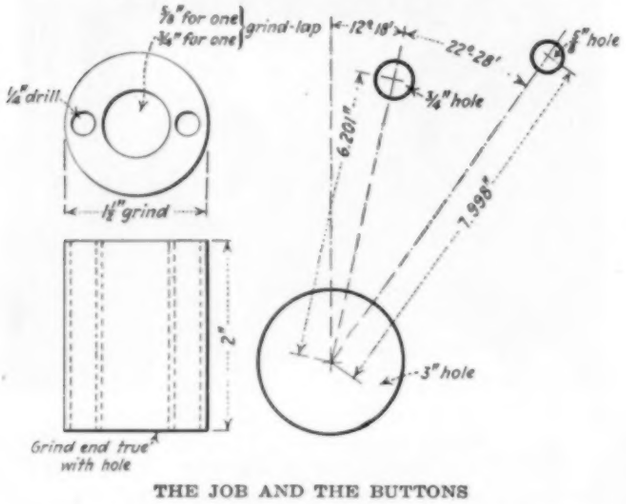
Bushings Used as Buttons for Locating Holes Accurately

BY HARRIE M. PIKE

Several years ago while the writer was working on jigs and fixtures in connection with engines for airplanes, he was shown the following kink for locating holes accurately upon work that is too large and heavy to be buttoned and bored in the usual manner.

The holes in question were to be jigged in the hub of the engine flywheel, and bore an important relation to the timing gear, so important in fact that no tolerance at all was allowed in locating them. Upon a smaller piece of work that could be swung up in a lathe or handled on the table of an ordinary toolroom milling machine, this part of the work would have presented no difficulty; but as such procedure was out of the question, some other method had to be devised.

The holes were laid out on radial lines extending from the center of the hub, their location being determined in thousandths of an inch from the center and in degrees and minutes of arc from a given radial. Hollow buttons, or bushings, were made as shown in the sketch. The internal diameter was ground accurately



THE JOB AND THE BUTTONS

to the size of the hole to be made and the outer diameter was ground to a standard size, leaving sufficient thickness of wall to accommodate the two small holes for the attaching screws.

The bushings were first located approximately and attached to the jig by means of two machine screws fitting loosely in the screw holes. They were then positioned exactly by triangulation and measurement over their outer surfaces with micrometers in the usual way, as would be done with ordinary buttons.

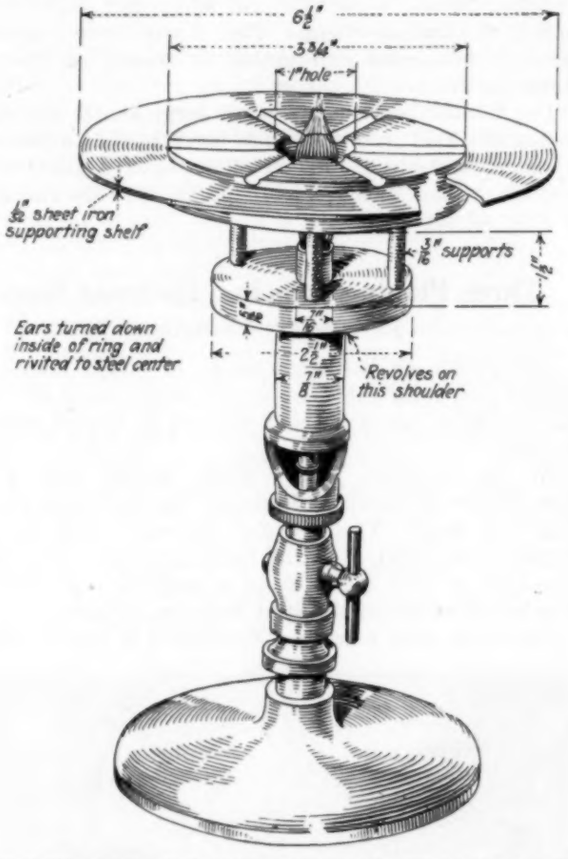
The job was then placed on the table of a true-running drill press and the holes drilled and reamed through the bushings. The total accumulated error was but 0.0002 inch.

An Improvised Hardening Furnace

BY DWIGHT DONALD

Fifteen hundred degrees from a small bunsen gas burner can be harnessed up to do a lot of hardening of small parts.

The sketch shows such a burner fitted with a simple metal plate, with several grooves running radially from the open center, attached above a collar which allows the combined apparatus to drop in a central position over the burner. The plate, which has an outer ring of ⅛-in. sheet metal to reduce weight, can be revolved about the burner for convenience in withdrawing the work from the flame. The sketch furnishes all details.



A BUNSEN BURNER HEATING FURNACE FOR SMALL RODS

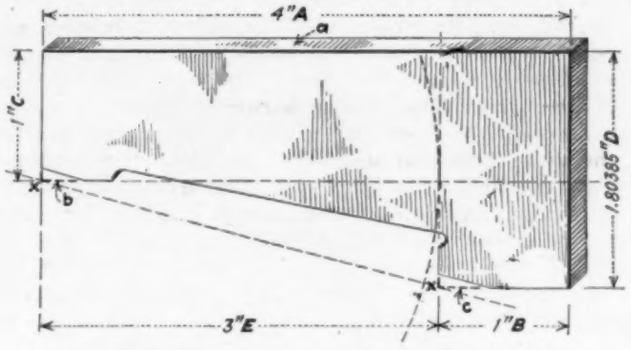
This simple fixture was designed for use in a small shop, to supply an inexpensive and efficient method of hardening the ends of a large number of ¼ in. in diameter rods. The rods are placed in the grooves one at a time with the ends over the center of the flame, are removed in the same sequence when they reach the proper heat and are quenched in the hardening bath.

A continuous heat-treating process at constant temperature, with a resulting uniform hardness of parts, is thus afforded.

What the Mechanic Used Before the Sine-Bar Was Invented

By Amos Ferber

Although the sine-bar in its present well-known form is a comparatively new development, the principle on which it is based is as old as mathematics, and the older mechanics were by no means unfamiliar with the practical application of it, though they may never have applied a name to the device they used. In the sketch may be seen the tool used by the writer for many years before the introduction of the sine-bar for applying the



TANGENT GAGE FOR LAYING OFF ANGLES

trigonometrical function to the development of angles.

Let us say that an angle of 15 deg. (the angle shown in the sketch) is required, and there is no bevel protractor at hand or the protractor is not sufficiently accurate for the purpose.

Take a piece of sheet metal of any size and thickness convenient and cut it roughly to the shape shown in the sketch, making sure that we leave sufficient stock at the essential points to secure accurate measurements. The thickness of the metal is of no importance, except that the thicker it is the more stock there is to cut away and the longer time will be needed to make the device. Metal thin enough to cut with the hand shears may be used if the device is wanted in a hurry and permanency is not a consideration.

After cutting roughly to shape, set the piece in a shaper or vise of a surface grinding machine, and reduce the surfaces *a*, *b* and *c* accurately to parallelism; also make both ends accurately square. The actual length and width of the piece does not matter, but the corners indicated at *x x* must be left sharp, as it is upon these corners that the serviceability of the tool depends.

Now measure the length of the piece over all (dimension *A*) with a micrometer. Next file or grind the inner face of the angle at *c* until dimension *B* subtracted from dimension *A* leaves exactly the chosen radius upon which the angle is computed, in this case 3 in., dimension *E*.

Now grind the under face at *b* until dimension *C* subtracted from dimension *D* leaves exactly the *tangent* of the required angle multiplied by the chosen radius. The angle sought will now be included between the longer surface *a* and a straight-edge laid across the sharp corners *x x* as indicated by the dotted lines.

The tool in this shape is available for laying off the angle it represents upon the polished surface of a jig or fixture, but the sharp corners could not be expected to stand up very well if the tool were to be banged around a milling or grinding machine very much in setting up work. To avoid impairment of its accuracy and preserve the tool for continued use, set it in the vise of the grinder with the corners uppermost and carefully level these corners by means of a sensitive indicator. You may now grind away as much of the corners as may be necessary to secure a permanent bearing surface, without affecting the included angle.

If this tool were to have a name, it should be called a "tangent gage," as the sine of the angle is not considered.

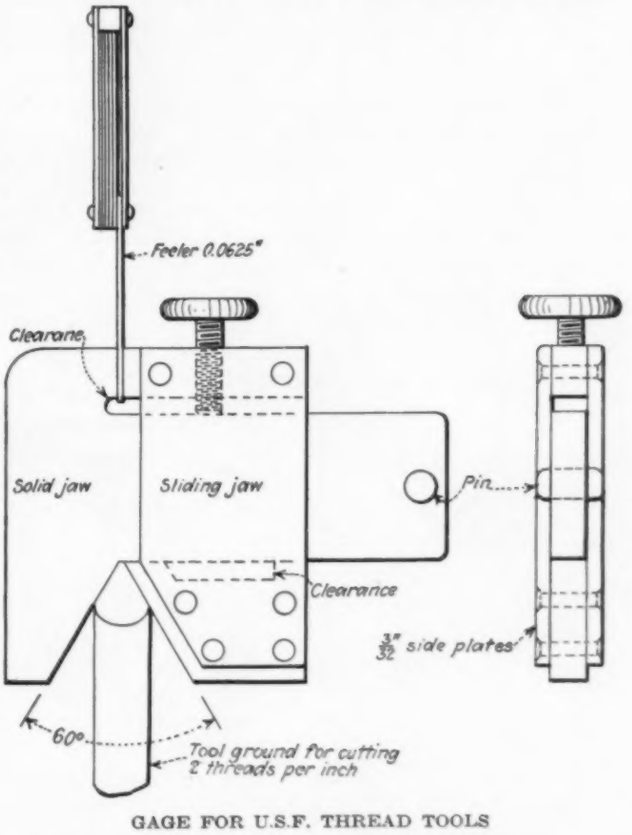
Form Gage for U.S.F. Thread Tools

By Joe V. Romig

An adjustable gage for use in forming thread tools to cut U.S.F. threads is shown in the accompanying sketch.

The shear, one of the setting jaws and the fixed angular jaw are made in one piece. The sliding jaw is made up of four pieces, the thin side plates being riveted to the angular jaw face and to the top piece so as to leave just sufficient space for the assembled part to slide over the shear without shake. A small knurled setscrew in the top of the sliding jaw preserves the setting. Note that a clearance space is left at the point where the angular jaw bears upon the shear.

The setting jaws should be so made as to touch at the instant the space at the apex of the angle disappears.



GAGE FOR U.S.F. THREAD TOOLS

A good way to do this is to make them a trifle too long and fit them by lapping between the surfaces, testing as the work proceeds with an accurate center gage.

To set the gage to any given size of U.S.F. tool it is necessary only to provide a feeler gage of a thickness equal to the width of flat (⅛ of the pitch), and close the setting jaws upon it.

Air Cylinder for Jigs and Fixtures

By Charles B. Johnson

The relative merits of hand- and pneumatically-operated tools are not generally understood by the average tool designer who has had little experience in the design of air-operated equipment. Many designers regard the designing and building of a pneumatically-operated fixture, jig or attachment as something justifiable only when the first cost is not to be considered and when an unlimited number of parts are to be produced.

In designing a pneumatically-operated tool the first question to be answered is, can the piece be located by air? The best arrangement for locating is by means of suitable push rods for moving the piece to its proper locating seat. These rods are operated by a cylinder large enough to seat the piece firmly. For clamping, a larger cylinder is used, as more power is required to hold the piece in place than merely to locate it.

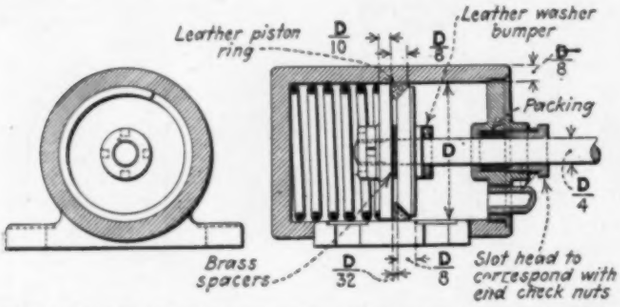
The next thing to be determined is the amount of pressure required to hold the piece firmly in place while the operation is performed. A close approximation of the pressure required may be secured by calculating the probable pressure exerted by the clamping arrangement if the tool were hand-operated. In other words, if a ⅝-in. clamping bolt were to be used, the pneumatic tool must exert an equivalent amount of pressure.

When this pressure has been determined or assumed, the piston diameter D is secured by using the formula:

$$D = 2\sqrt{\frac{P}{201}}$$

The calculated pressure is P; 201 is a constant. The efficiency of the air is taken care of in this formula. Ordinarily the efficiency of an air cylinder is from 70 to 80 per cent.

The next important decision is whether the cylinder is to be detachable or incorporated in the casting. Cylinders up to 2 in. in diameter are cast in the base if



DETAILS OF AN AIR CYLINDER FOR JIGS AND FIXTURES

a minimum amount of pressure is required and if there is no objection to the piston rod and clamping arrangement projecting outside of the solid base casting. The cylinder is formed by counterboring holes for the piston head and the necessary spring. The hole is tapped to receive a plug which closes the end of the cylinder, and the piston rod operates through this plug.

Cylinders over 2 in. in diameter are usually made detachable. The principal advantages of this method are many. The base casting may be cored, eliminating much superfluous weight, and the cylinder may be placed in the most convenient place for operating the clamping mechanism. The piston rod may be easily aligned, and the cylinder may be taken apart for repairing, or may be used for more than one piece of equipment.

The accompanying illustration shows a simple cylinder with dimensions proportional to the diameter. The cylinder is a bronze casting, the base of which is wide enough to allow the use of a screwdriver or wrench in tightening the screws which hold the cylinder to the base casting. The screw slots should be wide enough to allow shifting in aligning the piston rod. The cylinder itself is counterbored for the piston head and is threaded for the large plug which forms one end of the cylinder.

The large plug has a boss on both sides for counterboring and tapping the space allowed for the packing and the smaller plug. The smaller plug guides the piston rod, compresses the packing and prevents the leakage of air. Its head should be slotted to correspond with the end-check nuts and should be made long enough to allow adjustment for wear. The boss on the outside of the large plug should be milled either square or hexagonal for wrench adjustment. The larger plug is reamed a few thousandths of an inch large (usually about 0.010 in.) to allow the necessary clearance for aligning or operating. The leakage of air is prevented by the smaller plug and the packing.

The pipe furnishing the air supply is commonly tapped into the large plug. The intake and exhaust of the air is controlled by a simple three-way valve located in the pipe line.

The piston head is made with a good sliding-fit in the cylinder and is held in place by two nuts, one of which acts as a check. The leather packing and several brass spacers of varying thickness are placed between the piston head and the backing plate which is held in place by the collar. This collar may be driven on or pinned to the piston rod. When the packing becomes worn, it may be tightened by removing the larger plug, withdrawing the entire mechanism from the cylinder, taking off the end nuts and removing spacers enough to decrease the distance between the backing plate and piston head, and thus forcing the packing ring to expand by moving it up the angle on the backing plate. By inserting enough spacers, this adjustment may be made a number of times, thereby eliminating one of the principal objections to air cylinders.

The spring is for releasing the clamps and should be just strong enough to accomplish this. The outside diameter of the spring must be small enough to allow sufficient clearance to operate during its compression.

When only a small diameter spring is necessary, due to the ease with which the clamping mechanism releases, provision should be made for holding the spring exactly in the center of the cylinder. This will prevent the spring from dropping to the bottom of the cylinder, and from exerting an unequal pressure, which would have a tendency to tip the piston head and make it bind. The best means for holding the spring in the center is to tap or press a small piece of drill rod in the rear of the cylinder. The piece should not be long enough to strike the end of the piston rod when the piston head is moved sufficiently to operate the clamps.

The pipe line should be as straight as possible and the check valve should be placed between the three-way valve and the air supply. An exhaust hole usually ⅛-in. in diameter should be located behind the piston. Because of the great friction, wedge systems of levers and clamps should be avoided.

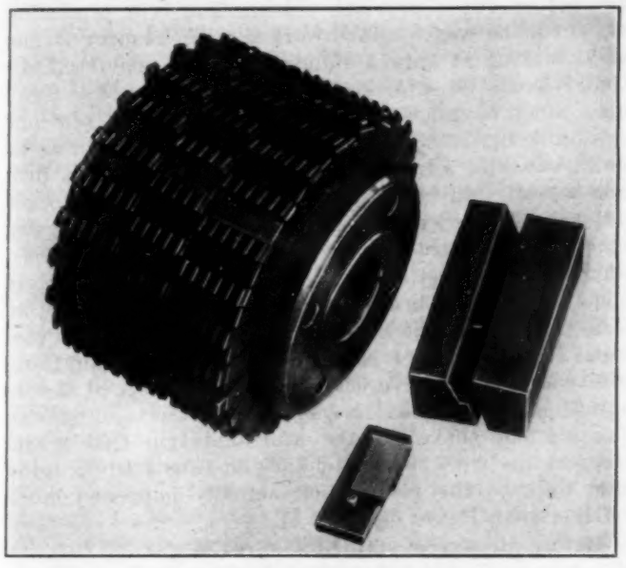
If care is taken to design air clamping mechanisms with due reference to the pressure involved, both in the cylinder and in the spring used for returning the piston, satisfactory results will be secured.

An Inserted Blade Cutter of Exacting Requirements

By Milton Wright

The illustration shows a cutter with inserted blades of high-speed steel that is made in a manner somewhat unusual when the purpose it is to serve is considered. The serrations of the blades do not constitute a helix but are in separate planes, the cutter being used to form the rack teeth on the bar of a large monkey wrench.

The cutter is 5¾ in. in diameter by 3¾ in. long when assembled, being made in three 1¼-in. sections with 24 blades to each section. The sections are keyed to a shouldered bushing and are clamped tightly together



INSERTED BLADE MILLING CUTTER

by the ring nut of the bushing, so that when assembled the cutter may be handled on and off the milling machine arbor as a single piece.

The individual blades are 1.250 in. long and $\frac{7}{16}$ in. thick at one end, being wedge-shaped, or tapered, to an angle of 2 deg., and are held in the slots only by the pressure of the drive fit. This method of holding is common enough in cutters that are used only for surface milling or facing and the blades of which can be ground in position after assembling, but when the tool is called upon to mill the teeth of a rack in which no variation can be permitted and the blades are completely finished before they are set into the body, it is quite another matter, and involves careful and painstaking workmanship.

The blades are made to form and size, plus grinding allowance, and the teeth are cut in them with a single piece hob of small diameter. For this latter operation the blades are held in the special vise jaws shown to the right in the illustration; the angle at which they are presented to the hob being 10 deg., which provides the necessary relief without any further backing off. No side clearance is allowed.

After hardening, the blades are ground to thickness and taper, and in this operation extreme accuracy is required; a variation of 0.0001 in. being sufficient to throw the teeth out of register. The only special tools required are the little tapered "parallel" upon which the extra blade is shown in the picture, and a gage into which each blade is fitted. The work is held for grinding upon a magnetic chuck. These blades are made up in quantities without reference to the body of the cutter and are interchangeable.

The cutter shown is one of many such cutters that are in constant service in the factory, there being as many bushings as there are manufacturing machines. Any blade fits any slot in any section of cutter and the sections are used in whatever combination may be convenient. It is this interchangeability throughout a large set of tools, the requirements of which are so exacting, that renders the method of construction unusual.

The staggered position of the blades in the assembly is for the purpose of making the cut as nearly continuous as possible and avoiding the chatter that would be caused by the intermittent action if the entire tooth face were parallel to the axis of rotation. To secure this effect in assembling it is necessary only to select three sections the keyways of which are not in the same relation to the blade positions.

These cutters are in service in the factory of Billings & Spencer and were designed by W. R. Croke, superintendent of the tool department.

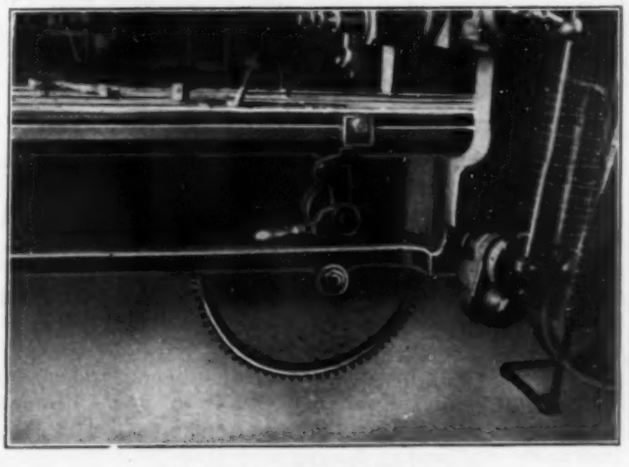
Guarding the Bull Gear of a Planer

By Donald A. Hampson

The factory inspection department of New York State has recently called attention to a hazard which has hitherto remained unguarded—that of the spoked type of bull gear and its mating point with the pinion. Official attention to these hazards was directed through several accidents occuring at about the same time. The fact that the injured men apparently went out of their way to get caught, does not relieve the employer of responsibility.

In the illustration may be seen a simple but effective way of protecting the spoked wheel. The hazard in any kind of a spoked wheel lies in the possibility of an arm or a foot being thrust through and getting caught against a stationary part of the machine, resulting in a broken bone, if nothing more serious. If the spokes can be converted into a web, the hazard no longer exists. A notable example of such conversion may be seen on job presses in printing plants where wheels with slender arms are made safe by the application of paper disks.

The planer shown in the foreground is one of a



GUARD FOR BULL WHEEL

group having the bull wheels exposed, that was protected by screwing together circles cut from ½-in. boards, one circle on each side of the arms. Protection is as complete as the appearance is neat.

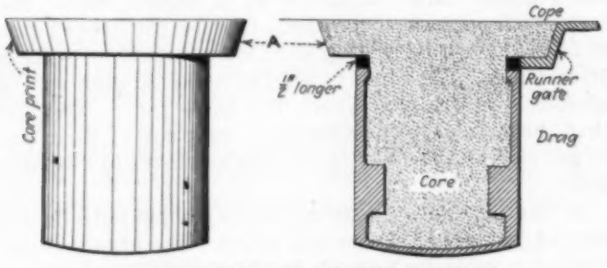
Where the gear and pinion mesh, there exists a danger point on the return stroke of the planer. This may be protected by a piece of sheet metal wide enough to include several teeth on each gear, and with tabs extending on each side to where they may be caught under the bolts of the bearings caps. It requires more of a fender than a guard such as would be needed where the gears are on top near to working positions of the hands. A more elaborate design would be a hood to completely surround both gears, but the expense of constructing and the difficulty of fastening underneath seem hardly warranted when the simpler design affords safety.

Pattern for Gas Engine Pistons

By James H. Yates

All repair men know the difficulty of securing good clean castings for gas engine pistons when they are poured from the regular melt in conjunction with regular foundry work. If the pattern is made in accordance with the following suggestions a better result will be obtained in many cases:

A core print is made to extend outward from the pattern, as shown at *A*, for a distance of about ¾ in. all around. The core itself rests upon this extension in the mold, thus centering the core and insuring per-



PATTERN FOR GAS ENGINE PISTONS

fect alignment and even thickness of the piston wall. It is advisable to make the pattern somewhat longer than the finished piston is to be, say ½ in., so that any dirt that may rise from the mold will be in that part of the casting that is to be machined off.

The main advantage of this method lies in casting the piston with the head downward so that there will be good, clean, close-grained iron at the head where it is most essential.

Selling a Tough Customer—Discussion

By F. P. Terry

The contribution by Hiram Strong under the above heading, page 893, Vol. 56, of *American Machinist*, provides interesting reading, as does any method that shows a way of overcoming a probable but un-get-at-able customer. Mr. Strong's success with "Bill Jones" appears to be due principally to the fact that he did not "sell him," but actually took considerable pains to see that he was not sold.

There are many Bill Joneses scattered about the world, and it is probably as well that this is so. As a brother salesman once told me, "They are sent by the Almighty just to try us," and in dealing with them no doubt many salesmen are found wanting simply because they lack initiative and resource. There is no standardized method that I ever heard of for this type of customer beyond "weighing him up" and then bucking in, letting him see by the best possible means that his abuse has as much effect as water on a duck's back. This also requires nerve, otherwise no ice will be cut. With these qualifications and a reliable tool that will stand the test of wide publicity and come up to the standard set for it, no salesman need despair but that Bill Jones will be landed in due course.

My first experience of this type happened some years ago when I knew little of the game, but how I overcame this Bill Jones may be of interest. He occupied, and still does, the position of manager of a large firm, and, quite unknown to me, he had a "grouse" up against us for a previous transaction. On producing my card, the way his face worked when reading it and then tearing it into a hundred pieces, convinced me that I would be safer elsewhere, and no doubt a timid man would have bolted for the door. I simply kept one eye on it and stood my ground, but not for long, as he burst out with a lot of Bill Jones abuse about my firm and myself, and in addition gave me one minute to get out and threatened that should I ever visit him again, amongst other tortures I would be shot. With a pleasant good-day I retired, and once safely into the street some imp in my brain set to work to overcome him.

Before my next journey I had particulars of our previous trouble, which from ignorance more than anything else was not to our credit, but as it happened before my time I saw no reason why I should stop calling, and I could not shake off the aforesaid imp that would impress me with the credit sure to follow in bringing him back to the fold, which actually happened much quicker than I ever dreamed of.

Before my second visit I had a real slap-bang cut-and-dried story to put before him, but I will not repeat it here, as, like the curate's sermon, when required it was not on tap, and a very good job too. I walked boldly into the office, and like all other Bill Joneses, he had a good memory for faces and didn't want my card. He thundered out, "What the — are you doing here, didn't I — well tell you never to come in that — door again?" After a lot more unprintable language which completely upset my programme, at the first opportunity I meekly replied, "I just called to see if you were dead." Further explanations were demanded, and I added that I knew perfectly well that he would never buy anything from us and my only chance was when a new manager came along, which wouldn't be in his lifetime. His attitude changed immediately, and beyond his reply that he wouldn't have any damn fool wandering around the country wishing him dead, we soon drifted into ordinary conversation.

To cut the story short, I was soon seated in his private office and left with an order. Other orders have followed since and today I number him among my very best friends. We have laughed many times over the incident, and probably he may laugh again as he reads the *American Machinist*.

Other similar stories could be told, but the above satisfied me once and for all time that the cut-and-dried method is useless, and above all as this journal proclaims, "Only reliable products can be continually advertised." It naturally follows that it is only the same that can be continually sold, after which it is only a matter of the right salesman.

Editorial

Standardization and Exports

TOO many manufacturers have considered all efforts at standardization as unnecessary frills which had little or no commercial value. The report of Oscar R. Wikander, who represented the American Engineering Standards Committee at conferences concerning international standards for ball bearings, shows clearly just how standardization is going to directly affect export trade. His example of the 700 locomotives being built for Russia points out very clearly the handicap which must be overcome by American locomotive builders before they can compete for locomotives of this class.

It does not matter so much from the economic point of view whether the standards be German or American, so long as they are good standards. For the best standards must and will become international as time goes on and we become more and more inter-dependent. What does matter is that the country which first adopts *good* standards and gets them into use, will have the jump on all the rest when it comes to repeat orders.

We have led the world in interchangeable manufacture which requires certain standards within the shop doing the work. But we have been slow in adopting standards throughout any big industry except that of automobile building.

Unless we wake up to the importance of standardization we are likely to have inquiries from foreign countries for goods made to German or other standards. And if we are to be content to follow rather than lead in the work of standardization, we should at least keep posted as to what German standards are so as to be able to bid intelligently if asked to do so. As the leading manufacturing nation of the globe we should do our share in the work of standardization which is very evidently well under way.

Our Fallen Idols

WE USED to think of locomotive engineers and firemen as a superior kind of workers, the cream of labor, a kind of aristocracy; not because they were richer, or better educated or possessed greater skill or ability, but because we recognized in them men of character. We saw that they had ideals, beyond and above their wages. We instinctively admired their devotion to duty. We were not surprised to read of an engineer sticking to his post in the face of death, refusing to save himself, his last act saving his passengers.

In the days when unions were not so common and not so generally accepted, when a large portion of the public was opposed to them and their activities, the brotherhoods received almost universal sympathy. They too, were of a higher order, more constructive, never rowdy, never breathing hatred for others, though always properly alert for chances to improve their condition.

When these brotherhoods made demands, we naturally wished that they might succeed, for we wanted our heroes to prosper. We were with them, as they deserved.

And now—engineers and firemen leaving their trains in the desert, exposing women and children, mothers-to-be, aged folks and babies to suffering and death. Not in the heat of passion, not even in the face of danger, but cold-bloodedly, wickedly, meanly. They sold their reputation, their manhood, their honor for a mess of pottage for their friends. The captain deserting the ship in time of danger, for the sake of a few dollars! The disgusting performance challenges the power of the English language.

We hoped that it was the action of a few, wondering meanwhile why these few should all be found in one location—in the desert. We waited anxiously the words of scathing denunciation to be pronounced by the heads of their brotherhoods. We expected their unions to kick out the rotten members, as unfit to associate with the rest of them. We felt almost sure that the heads of the brotherhoods would issue a proclamation to the world at large, condemning such unspeakable conduct and asserting that it was far from the ideals of the majority.

Instead, they announced that the strike—mind, they called this cowardly act a strike—that the strike was unauthorized, and that the leaders are to be discharged as such, thus proclaiming that the men are mere puppets, irresponsibles and that the union heads are the real union.

How our idols are fallen!

Just Suppose

JUST suppose a superintendent should tell his men, that being all good mechanics, there was no sense in telling them how much allowance there should be between a shaft and its bearing; nor how tight a drive should be between the axle and the car wheel. Suppose he told them that each should do his own hardening, and that he might choose a temperature best suited to his personality and disposition. Suppose he allowed each man to select a bar from the steel rack instead of handing him his material according to specifications. Wouldn't you immediately inquire as to the location of the nearest insane asylum?

But suppose you met a superintendent, who allows each man to grind his own tools according to his notions, and probably never twice the same way, who declares that each man knows best what he needs for his work, though there may be ten men doing the same job and all with differently ground tools. Suppose you meet such a man, do you shake your head and say sadly: "Poor fellow—do you think it is the heat?"

And suppose you came into a shop where things are made in quantities, and many machines working on the same operation, but with different feeds, speeds and tools, because, as the super says, each man knows best his own conditions, wouldn't you wonder about that?

You have been in shops where every man selects his own feeds and speeds—and grinds his own tools according to his own ideas. Suppose we go a step further and let every man select his own dimensions and fits.

Oh, well, now, you know, this is foolishness. Well, perhaps, but—

Just suppose.

Shop Equipment News

Oilgear High-Speed Hydraulic Broaching Machine

An hydraulic broaching machine for operating at high speed has recently been placed on the market by the Oilgear Co., Milwaukee, Wis., a general view of the machine being shown in Fig. 1. The machine is stated to have a great capacity for work, chiefly because of the wide range of speeds available with the maximum at 360 in. per minute, the ease of selection and adjustment of the speed, and the independent operation of the automatic controls for both the cutting and return strokes. The overall efficiency is stated to be high, ranging from 70 to 90 per cent, as no power is wasted in gears or screw drives.

A standard Type-MD, variable-delivery pump, similar in design and operation to those used in the Oilgear variable speed drives previously described in *American Machinist*, delivers a steady flow of oil to a double-acting cylinder, whose piston rod is connected to a sliding head which operates on ways in a U-shaped trough of the usual design. A close view of the mechanism is shown in Fig. 2. The amount of oil delivered to the cylinder depends on the length of the pump stroke, and this length can be varied from zero to a maximum. As the speed of piston travel depends on the amount of oil pumped into the cylinder, this speed can be changed at will merely by changing the pump stroke. The cutting stroke is started without shock and the pull is steady.

Very slight variations of speed within the limits of 48 and 360 in. per minute are easily obtainable. The right speed may be quickly selected for different materials and different broaches. The speed of the return stroke is adjustable independently of that selected for the cutting stroke. Automatic stops are provided which can be set for any desired length of stroke. There is no over-running, so that the broach will be pulled beyond the reducing bushings and be caught on the reverse. Little effort is needed to reverse the machine, as there are no heavy clutches to shift. Simply pressing down on a small push-button operates the reverse, or the control can be set for automatic reversal. An emergency lever enables the operator to stop the machine instantly at any point of the stroke.

Quick-acting relief valves prevent damage to the broach. These valves, one of which is placed on the cutting end and one on the return end, automatically relieve the pressure and stop the machine whenever the pressure builds up to a predetermined point. The machine is driven by vertical belt from a lineshaft or motor. The motor may be mounted above the main cylinder on an adjustable support.

The following actual production figures are given as representative of those obtainable. The work consisted of broaching four solid keys in a differential bevel gear of 1¼-in. bore, 2 in. long, and made of 0.22 per cent carbon steel. The cutting speed was 288 in. per minute and the return speed 312 in. per minute. There were two broaches in the set, and the draws per hour averaged 145. The maximum horsepower used was 5½ for a cutting time of 6½ seconds.

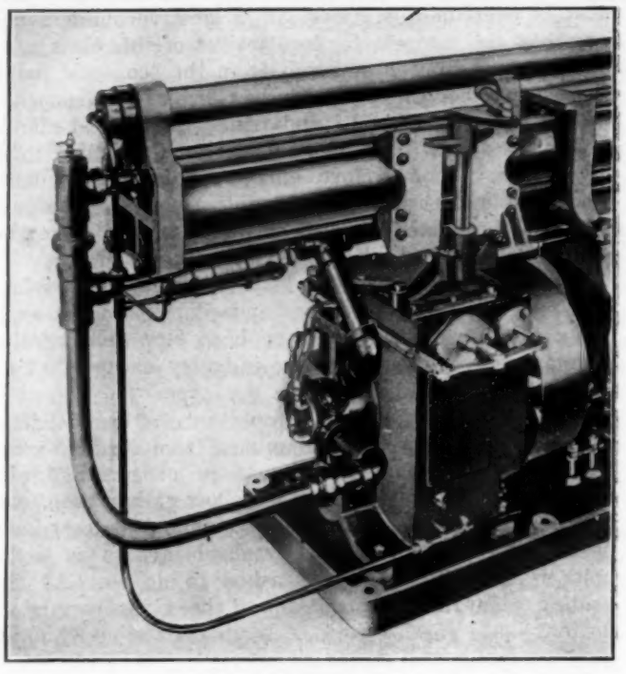


FIG. 2—DRIVING MECHANISM OF OILGEAR BROACHING MACHINE

The principal specifications of the machine are as follows: Pulling capacity, 16,000 lb. (equivalent to that required by a 2-in. square broach designed according to standard practice). Speed range for either cutting or return strokes, 48 to 360 in. per minute. Stroke, 56 in. Diameter of hole in faceplate, 5 in. Vertical adjustment of drawing head, 1⅜ in. above and 1⅜ in. below center. Driving pulley, 18 in. in diameter by 5 in. face. Speed of pulley, 600 r.p.m. Motor size recommended, 10 hp. Floor space, 16 ft. by 26 in. Net weight, 2,900 pounds.

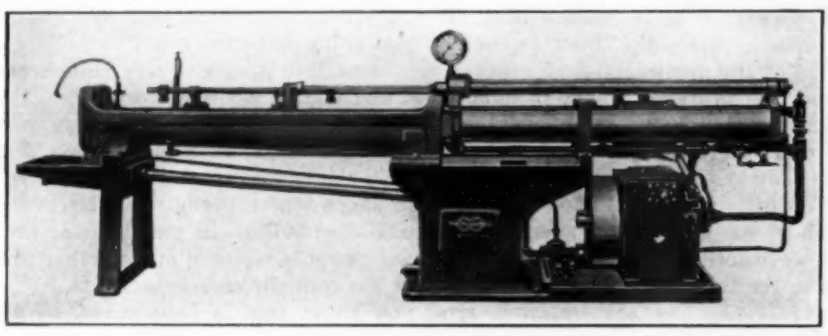


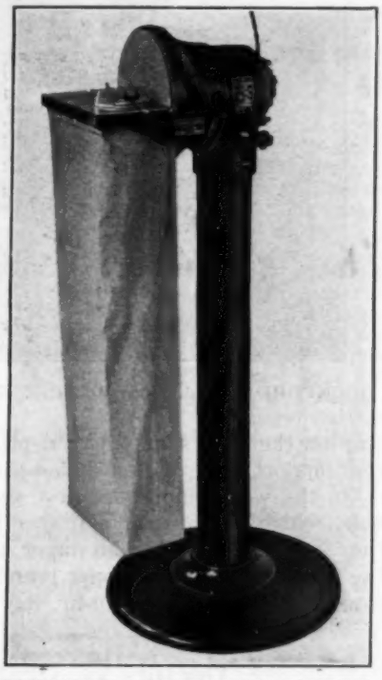
FIG. 1—OILGEAR HIGH-SPEED HYDRAULIC BROACHING MACHINE

Erratum

Under the heading of "Cleveland Double-Ended Automatic Threading Machine" on page 313 of *American Machinist*, the capacity of the machine was wrongly given as 1⅛ in. in diameter, due to a typographical error. The capacity should have been stated as 1⅞ in., as the machine is adaptable to threading large staybolts.

Syracuse Portable 9-Inch Disk Sander

The Syracuse Sander Manufacturing Co., Inc., Syracuse, N. Y., is now marketing the 9-in. motor-driven disk sander shown in the accompanying illustration. The machine is suited to general work, being fitted with garnet paper disks for sanding wood and grinding brass and aluminum, while emery cloth is used for iron and steel.



SYRACUSE 9-INCH DISK SANDER

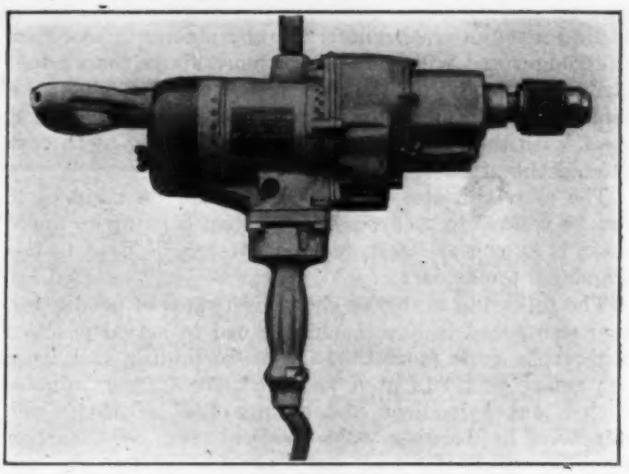
The machine is mounted on a pedestal and is easily portable. It can be connected to any convenient light socket, the motor being furnished to suit the type of current available. The disk is driven directly by a ⅓-hp. G.E. enclosed motor running at 1,725 r.p.m. A tumbler switch is provided on the end of the motor. The table is 5¼x10 in. in size and 38 in. from the floor. It may be tilted 45 deg. down and 15 deg. up. A thumbscrew serves to tighten the table securely at any angle, the setting being shown on a plate graduated in degrees and mounted on the side of the machine. The table is equipped with a graduated angle gage.

The entire head is mounted on a pedestal by means of a swivel joint, so that the work can be easily turned toward the light. A canvas bag is attached to the table for catching the dust thrown from the disk.

"Independent" Reversible Portable Electric Drill

The Independent Pneumatic Tool Co., Chicago, Ill., manufacturers of the "Thor" line of pneumatic and electric tools, has just placed on the market the reversible portable electric drill herewith illustrated. The direction of motion is reversed mechanically, so as to eliminate the electric troubles that may occur when the reverse is obtained electrically. The motor runs always in the same direction and is not subjected to the shock which results from reversing the current with the motor running at speed and under load. The mechanical reversing device is located in the gear case.

The reversing gear is equipped with a locking device which can be shifted instantly to permit of three motions as follows: The first motion is a locked constant forward motion for general drilling, reaming, stud driving, nut tightening and tube rolling; the second is a locked constant reverse motion for backing off nuts and backing out studs and tube rollers; and the third is a neutral position which allows the spindle to slip into forward motion when the machine is pressed forward against the work, and to slip into the reverse motion as the machine is withdrawn from the work. This last is an automatic action that follows the operator's movements and makes the tool suitable for work such as wood boring, tapping, and flue rolling, where drive by power in both directions is required.



"INDEPENDENT" REVERSIBLE ELECTRIC DRILL

Although here applied to an electric drill, the reversing mechanism is adaptable to both electric and pneumatic tools of all sizes. The maker stresses particularly the durability of the device.

Diamond Alloy Cutting Metal

A non-ferrous alloy for metal cutting that possesses unusual hardness and resistance to wear has been placed on the market under the name of "Diamond Alloy." The product is being manufactured by the Diamond Alloy Division of the Kent-Owens Machine Co., Toledo, Ohio, which concern has taken it over recently from the Diamond Alloy Tool Co., St. Louis, Mo. The alloy is being sold by P. H. Biggs, 1235 West 9th St., Cleveland, Ohio.

The alloy is composed of such metals as chromium, molybdenum and tungsten, melted together in such proportions as to produce a hard, fine-grained, homogeneous alloy. It is claimed to possess an unusual degree of resistance to wear, holding a keen cutting edge under the most severe conditions without any tendency to crumble even under an intermittent cut; also to possess a great heat resisting quality, as tools made of it will operate at such high speeds and feeds as to bring the cutting end of the tool almost to the point of fusion without any tendency to soften. Since the alloy is non-ferrous, it is also non-magnetic, a desirable property for many forms of cutting tools.

One of the most predominating features of the alloy is the fact that it can be cast in permanent molds into a great variety of forms such as milling cutters, end mills, reamers and similar tools. It maintains a uniform composition of permanent hardness, necessitating only a grinding operation to complete the finished tools, all heat treatments being eliminated.

Another feature lies in the ability to cast the alloy

around a tough steel center, thereby making a tool that is stronger and will stand much more abuse than a tool made completely of the cutting material. Thus the center of a milling cutter may be made of chrome-nickel steel, with the ring of Diamond Alloy cutting teeth cast around the steel.

The alloy can also be welded to steel. A strip of it can be welded to a chrome-nickel steel backing to make what is known as laminated tool bits, to be used in the standard toolholders.

The following examples show high rates of production that are stated to have been obtained in actual practice with tools made from this alloy. In milling cast iron, the cutter was run at a speed of 370 ft. per minute, with a cut $\frac{1}{8}$ in. deep and a table feed of 15 in. per minute. In turning 0.35 to 0.40 per cent carbon machine steel, the tool was operated at 285 ft. per minute with a cut $\frac{1}{4}$ in. deep and a feed of $\frac{1}{16}$ in. per revolution. In machining a chrome-nickel steel shaft, the speed was 125 ft. per minute with a cut $\frac{3}{32}$ in. deep and a feed of $\frac{1}{32}$ in. per revolution.

A toolholder designated as the "Super" toolholder has been developed for use in conjunction with various forms of cutter bits made of the Diamond Alloy. This holder is made in nine different sizes, the section ranging from $\frac{3}{8}$ x $\frac{3}{4}$ in. up to $1\frac{1}{4}$ x $2\frac{1}{2}$ in. in size.

The cutter bits are made with a taper shank which fits into a corresponding taper socket in the toolholder. The taper being a very gradual one, the pressure of the cut forces the tool bit tightly into the socket, so that no other clamping is necessary. With a single-point bit, the tool can be adapted as a right-hand, straight or left-hand tool, by simply changing the position of the tool bit in the holder.

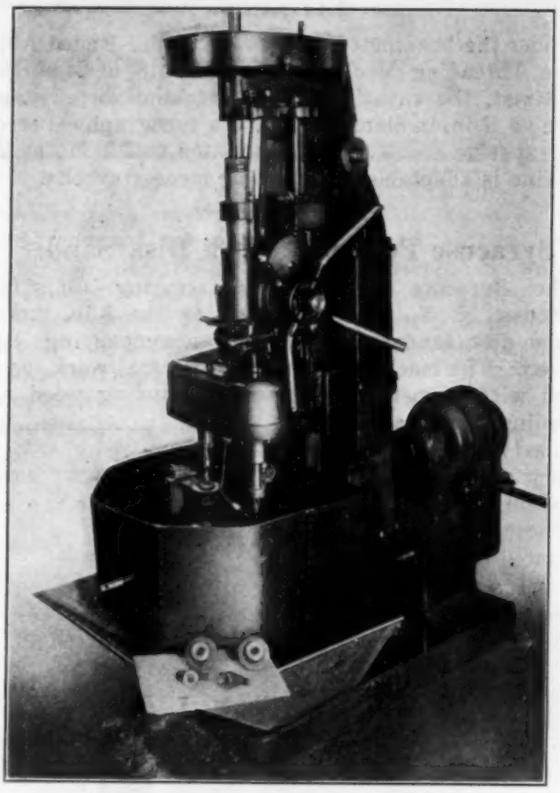
Rockford Rotary-Table Drilling Machine

An upright drilling machine especially fitted for multiple-operation work on small parts is shown in the accompanying illustration. The work that can be seen lying on the edge of the coolant trough of the machine consists in this case of parts of a universal joint. The special attachments for handling the joint have recently been placed on the market by the Rockford Drilling Machine Co., Rockford, Ill.

The machine is a standard 20-in., box-column Rockford drilling machine having capacity for a 2-in. high-speed steel drill when drilling steel. It is driven through a silent chain from an electric motor mounted in the rear. The speed can be changed by the use of interchangeable pick-off gears, and four changes of feed are provided by means of a gear box.

A four-station rotary table having an indexing plunger worked by a treadle is applied to the regular table. This rotary table is indexed by hand after the locating plunger is pulled out of position. The table carries four two-jaw chucks, with the jaws formed to suit the work. By means of an extended wrench, the chuck screws can be tightened from outside the chip guard.

The chucks are aligned under three work spindles so that three operations are performed simultaneously while the fourth chuck is being loaded. A finished piece is thus removed at each indexing. A special three-spindle head driven and fed by means of the spindle of the drilling machine is equipped with a V-shaped gibbed slide running on the ways of the column, and is counterweighted. A positive micrometer adjustment



ROCKFORD DRILLING MACHINE WITH ROTARY TABLE

stop on the quill serves as a depth gage. A drill bushing support is provided under the spindle on the left.

On the work shown the first spindle rough drills the hole, which is $\frac{3}{4}$ in. in diameter and $2\frac{3}{8}$ in. in length, the second spindle rough taper reams and faces, and the third spindle finish taper reams the hole. A production of 250 pieces per 10-hr. day is obtained.

Doctors vs. Draftsmen

BY CHARLES W. LEE

Some years ago I called on a lady of various attainments, inasmuch as she was a successful physician, a man-hater, and my aunt, and told her that I was about to become her fellow citizen, having just gotten a job (which she called "accepted a position") in her fair city.

"Fine!" she said, "and of what will your new work consist?"

"Making drawings of machinery."

"Is it possible? It is beyond my comprehension how a man"—remember that she was a man-hater and imagine the emphasis on "man"—"can be satisfied not only to spend his time making marks on sheets of paper, but to make a business of it!"

"Neither," said I, "is it within my understanding how a woman"—emphasis on "woman"—"can be satisfied to spend her life doing up powders in little pieces of paper!"

"Ah, but I have to know what is in the powders, and why."

"Precisely so, and I have to know where to put the lines, and why."

Which, strange as it may seem, especially to married men, closed the discussion.

News Section

Aeronautical Chamber of Commerce Elects Officers

At the annual meeting of the board of governors, Aeronautical Chamber of Commerce of America, 501 Fifth Ave., today, the following officers were elected: president, Inglis M. Uppercu, Aeromarine Plane and Motor Co., Keyport, N. J.; first vice-president, Charles L. Lawrence, Lawrence Aero-Engine Corporation, New York City; second vice-president, C. C. Witmer, Airship Manufacturing Co. of America, Hammondsport, New York; third vice-president, Lawrence B. Sperry, Lawrence Sperry Aircraft Co., Farmingdale, L. I.; treasurer, Charles H. Colvin, Pioneer Instrument Co., Brooklyn, N. Y.; general manager and assistant treasurer, S. S. Bradley; secretary, Luther K. Bell; assistant secretary, Owen A. Shannon.

Increases in the Board of Governors from eleven to fifteen were made as follows: I. M. Uppercu; G. M. Williams, general manager, Dayton Wright Co., Dayton, Ohio; W. C. Young, Goodyear Tire and Rubber Co., Akron, Ohio; Charles L. Lawrence.

Steady growth by the Aeronautical Chamber of Commerce was reported, recent additions to the membership including Goodrich Rubber Co., Akron, Ohio; Goodyear Tire and Rubber Co., Akron, Ohio; Wolverine Lubricants Co. of New York, New York; Rich Tool Co., Chicago, Ill.; Mosler Metal Products Corporation, Mt. Vernon, N. Y.

Steel Engineers' Convention Opens in Cleveland Sept. 11

The Association of Iron and Steel Electrical Engineers, through its secretary, John F. Kelley, has just made public the official program of its sixteenth annual convention and exhibit which will be held September 11 to 15, in the Cleveland Public Hall, Cleveland, Ohio.

The attendance this year is expected to exceed all previous records and engineers from the steel industry throughout the country will be present. Manufacturers of mechanical and electrical apparatus applicable to the iron and steel industry will demonstrate their products, close to one hundred manufacturing companies having taken space for exhibiting their equipment.

The exposition will be held on the first floor of the new public auditorium and the technical sessions will be held in the lecture hall in the same building.

A very elaborate program has been prepared for the technical sessions. Among those who will present papers are the following:

Dr. Charles P. Steinmetz, chief consulting engineer, General Electric Co.; B. G. Lamme, chief consulting engineer, Westinghouse Electric and Manufacturing Co.; A. G. Witting, assistant chief engineer, Illinois Steel Co.; F. C. Watson, electrical superintendent, International Nickel Co.; D. M. Petty, electrical superintendent, Lehigh Plant, Bethlehem Steel Co.; L. W. Heller, general superintendent power stations, Duquesne Light Co.; R. B. Gerhardt, electrical superintendent, Bethlehem Steel Co.; D. B. Rushmore, consulting engineer, General Electric Co.; and F. W. Cramer, engineer of tests, Cambria Steel Co.

Machinery News from Abroad

According to official figures just published at Budapest for the first six months of the present year, the exports of Hungarian made machinery have largely increased against the same period of the preceding year, nearly 60,000 quintals more than during the first six months of 1921. Half of the machines exported were agricultural machines and implements, the larger part of which went to Jugoslavia. A considerable number of steam locomotives and flour mill machinery was exported to Poland. The total exports of machinery during the first half year 1922 were as follows:

Machines and apparatus, 98,717 quintals valued at 1,411,000,000 Hungarian crowns; and electrical machinery, 16,026 quintals valued at 1,133,000,000 crowns.

As compared with the exports of other branches of the machinery industries, the exports of textile machinery from Great Britain have largely increased again, as will be seen from the following table:

	Weight in tons	*Total value*
1913	178,084	£8,282,000
1919	65,920	8,427,000
1920	63,614	9,159,000
1921	156,995	25,149,000

The per ton value of these exports in 1913 was £46.5, while in 1921, the per ton value was £160.

The increase in price is remarkable. Large orders were placed not only by India, China, and Japan, but also by the British dominions and South America. On the other hand, the exports to Russia, which in 1913 amounted to 15,308 tons, amounted in 1921 to only 3 tons. Germany, which in 1913 bought British textile machinery to the amount of 13,917 tons, received in 1921 only 341 tons.

A report from Budapest is to the effect that the German iron master, Hugo Stinnes, has just formed a company with headquarters at the Hungarian capital and a capital of 30 million Hungarian crowns for the purpose of exporting iron, steel and machinery.

The first locomotive built since the revolution in Russia has just left the St. Petersburg Railway shops. The cost of construction of this locomotive was no less than 75 milliards of Soviet rubles (75,000,000,000 rubles).

Branch Secretaries of National Metal Trades Meet

All but four of the twenty-four local branch secretaries of the National Metal Trades Association met August 16 and 17 at Milwaukee (Wis.) Athletic Club for their semi-annual conference.

The meeting was opened by W. W. Coleman of the Bucyrus Co., president of the National organization, who gave an interesting and instructive talk on the political history of Milwaukee and Wisconsin. Mr. Coleman pointed out that immigrants of a radical and socialistic tendency were in the majority among the early settlers. At one time a bill was introduced in the state legislature which required that all property be divided every Saturday, or oftener if necessary. It was defeated. His address was unusual in that much that he said has never before been compiled.

The visiting secretaries were surprised to learn that for many years the metal trades have predominated in the industrial activity of Milwaukee instead of the brewing industry. Interesting and educational papers were read and discussed by the secretaries including "An Up-to-Date Employment Bureau" by Chester M. Culver, "Objections to Legislation Favoring Unemployment and Health Insurance and Old Age Pensions" by J. M. Manly, "Experience of the Grand Rapids Branch of the National Metal Trades Association with their Mutual Workmen's Compensation Insurance Bureau" by A. W. Blodgett, "Comparative Wage Schedules" by W. J. Cronin, "What is Normal" by Lewis Atherton, "Legislation" by H. A. Jansen, "Superintendents' and Foremen's Clubs" by Paul Blatchford, "Need and Value of Economic Education of Employees" by Donald Tulloch, and "Turnover—Causes and Remedy" by T. G. Silkman.

A committee was appointed by Chairman Fairbairn to devise an improved and more comprehensive comparative statement of wages paid in the various localities, than that which has heretofore been issued by the local branches and the national office of the association.

The result of the survey recently completed by the Association in regard to industrial betterment work was presented in tabulated form showing the results accomplished.

In addition to national president Coleman, H. J. Wiegand of the Cutler-Hammer Co., who is president of the Milwaukee branch; Commissioner Sayre, Counselor Hibbard and Secretary Fischer of the National Metal Trades Association and some ten secretaries of closely allied associations; J. B. Dean of the American Tool Works Co., Paul T. Horton, of the Case Crane and Engineering Co., and J. W. O'Leary of Arthur J. O'Leary and Son Co., who are members of the executive committee of the national association, were present.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York
(Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

LOS ANGELES, CAL., Sept. 3, 1922.

FROM what I have seen and heard in San Francisco and Los Angeles, as well as in the fertile valleys through which one passes in going from one of these great cities to the other, I conclude that this region is almost immune to the depressing influences which are felt from time to time in other parts of the country. The fact is that much of the country's liquid wealth is being brought here by travelers who come as tourists and remain as residents. There is, therefore, an abnormal growth which severely taxes the facilities provided, although they are being increased with marvelous rapidity and enterprise. The result is great building activity, good trade and great prosperity in almost every branch of business.

Among those merchants who are engaged in the increasing foreign trade between the Pacific Coast and the Orient there is some apprehension lest the tariff bill will reduce our exports to Asia, Australia and New Zealand, but only those who look far ahead are much concerned over such a possibility and for the present at least the majority of the people seem happy and contented. From the number of automobiles that are to be seen on the excellent roads which cover the state and the crowded condition of the tourist camps that are to be found in every community it would seem that almost every one is making a motor trip, but the well filled hotels negate this idea and I am leaving here tonight in the belief that everyone in California is travelling either by motor or by train.

The primary political campaign which has resulted in the nomination of Hiram Johnson to succeed himself as U. S. Senator has been fought with much bitterness and has absorbed public attention for the last two or three weeks, but now that it is ended a period of quiescence is to be expected until the pre-election contest begins in October.

The most important indication of the course of business last week was to be found in the stock market. The collective mind seems to be wiser than any individual and as read in the trend of stock prices its prescience has become so proverbial that we say "the ticker never lies." In connection with other influences at work on business and prices, therefore, I consider it of first importance that both railway and industrial stocks last week reached high levels for the current upward movement, which is now nearly a year old, and that as many as sixty-five stocks recorded new high prices in a single day. These records were made despite the abandonment of efforts to settle the rail strike and the assurance that we face an autumn of transportation congestion and of high priced coal.

Coincidentally raw commodity and wholesale prices are in the main distinctly firmer, and retail prices, a buyer tells me, "are getting stiffer every day." There seems to be a great fear in many quarters that the ultimate consumer will not pay these prices, but the crops will bring in more money to the farmers, all our labor is employed, wagers are rising in many places, and it is my belief that the strength of the stock market expresses the confidence of the omniscient collective mind that trade will be of good volume and profitable for many months to come. It will be recalled that after the culmination of the last bull market in stocks in November, 1919, six months elapsed before deflation began in commodities, and I am inclined to think that the end of this rise in stocks is not very near while money remains so plentiful and cheap.

The wage advance announced by the United States Steel Corporation, which I commented on last week, has aroused wide discussion as to whether it is a momentary maladjustment portending unbalanced prices, and will therefore restrict business because those who receive low prices for their goods cannot pay high prices for what they buy, or whether it is an indication of rising wages and prices and expanding business everywhere. Those who hold the former view point to the downward tendency of wheat and some of the other crops as proof that the wage advance is not a move toward general readjustment, but this seems to me statistical jugglery because farm products as a whole are higher than they were last year and the declines are exceptions, not the rule. On the other hand wage increases have been reported in many other industries, notably the New England cotton mills, which are returning to the scale that prevailed before the strike. And as all industry will have to pay more for coal and for metal products, and later for other supplies, a general rise in prices and wages, appears to me extremely probable.

As for the belief that this inflation will be restrained by the refusal of consumers to buy, that seems to me to disregard the lessons of the past three years, in which it has been clearly demonstrated that people will buy anything as long as they think it is going higher, and that they do not refuse to buy until they have been repeatedly warned by rising interest rates and falling stock prices that commodities cannot go up forever.

As if we were not heading naturally into a period of secondary inflation, the savants in Washington are doing their best to put us there. A real menace is discoverable in the falling off of Federal tax receipts. For the fiscal year ended June 30 they were $3,197,451,083 against $4,595,357,062 in 1921. For July they were $46,000,000 below the same month last year. Expenditures have shown no such decrease and our tax burdens, though inordinate, are insufficient to pay the cost of government, and higher taxes, in some form, or continued government borrowing is inevitable. Nevertheless, Congress has put through a bonus bill which quite possibly will be passed over the President's veto, and which will add nearly $100,000,000 a year to our expenses immediately and about $4,000,000,000 before we are through with it. President Harding is confident the ship subsidy is not yet dead. In addition, Congress has passed a tariff which will raise price and wage levels. State governmental expenses and taxes are the heaviest in our time, and we have yet to reap the full harvest of the extensive county and municipal borrowing of the past year.

The inflationary effect of all these influences has often been touched on in these letters, and it is sufficient to say that the boom I have been expecting, meretricious and undesirable as it may be, seems to be fairly upon us.

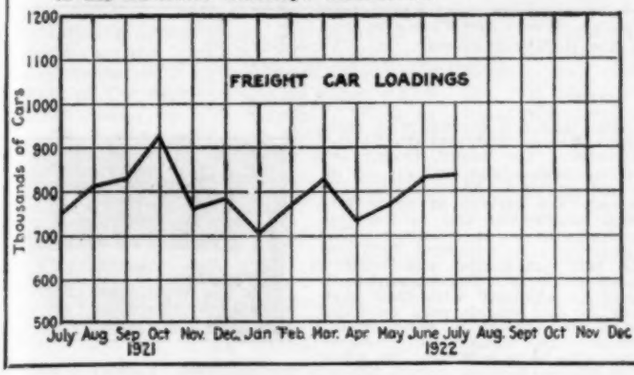
Sugar advanced sensationally last week as the strength of the statistical position asserted itself over the fear that consumptive channels were clogged. Coffee is slightly higher. Iron and steel have shown their expected advance.

The government report placing the condition of the cotton crop at 57 was just about in line with expectations and a general willingness to take profits resulted in a brief convulsion during which prices dropped 80 points. The indicated crop of 10,575,000 bales is small in comparison to probable needs, but mill men, despite good trade, are still uncertain whether they can sell goods manufactured out of cotton costing more than 22 cents a pound.

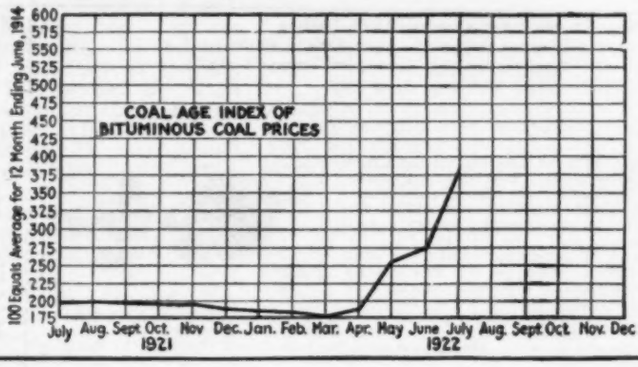
Other commodities are firm, Mr. Ford's denunciation of coal prices is timely and vigorous and his assertion that operators have conspired to raise prices through the strike reflects an opinion widely prevalent in the Northwest, but it is likely to have little effect on prices. The money markets are unchanged, and the Federal Reserve ratio shows but a small decline to 79.2 per cent.

Germany has been granted a provisional six months' respite in reparation payments which has brought about a recovery in the mark to 85 cents a thousand, and the international emergency is met just in time, as emergencies generally are. That has been proven true many times during the past few years, and it is extremely likely that if any of the factors restraining confidence on this side of the Atlantic becomes so serious as to constitute an emergency they will be promptly obliterated.

Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.



Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.



AMERICAN FOREIGN TRADE for the month of July shows that the value of exports was $30,000,000 below the June total. Imports also declined, being $9,000,000 less than the importations in the month previous. Cotton shipments abroad appear to be responsible for the decline in exports, July shipments totaling 373,742 bales, or a decline of about 118,000 bales in the thirty-day period. Exports of iron and steel continue light.

Railroad earnings, according to reports filed with the Interstate Commerce Commission, show a net operating income of $46,263,000 for 104 railroads of Class 1, representing a mileage of 141,380. In the corresponding month of last year, these same roads reported a net of $43,938,000.

Commercial paper rates remain unchanged around 4 per cent. The market appears to be somewhat firmer. The downward movement in the volume of commercial loans which has been going on steadily since the first of the year, appears to have ceased. In the United States since the beginning of 1921, the decline has been continuous from a point around 10 billions of dollars to around 7 billions at the current date.

Crop reports forecast a corn yield of over 3 billions of bushels. This, if fulfilled, will mark the fourth time in the country's history that a crop as large has been harvested. Cotton was estimated at 11,449,000 bales on July 25 by the Government, as compared with an actual yield in 1921 of 7,953,000 bales. On that date the condition was estimated at 70.8 per cent of normal as compared with 64.7 per cent a year ago.

World wholesale prices on basic commodities, using the 1913 average as equivalent to 100, show increases in many countries in July as compared with June. The index for the United States is 155. The *Economist* computes that of Great Britain as being 163. France is reported as being around 325, Italy at 537, Japan at 201, Canada at 166 and Germany at 13,935. In the case of Germany the increase in July alone was 52.5 per cent.

Construction contracts awarded for buildings of all classes during July in 27 northeastern states totaled $350,000,000, an increase of 2 per cent over June awards and an increase of 65 per cent over the total for July, 1921.

Cotton spinning activity during July was somewhat increased, 31,975,269 spindles being operated during the month as compared with 31,877,015 in the month previous.

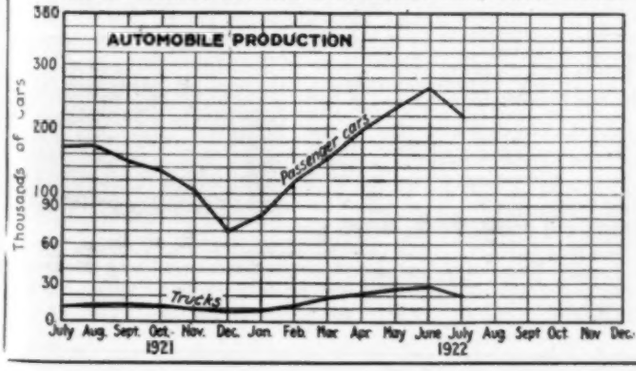
Loading of revenue freight on the railroads of the country totaled 856,219 cars during the week which ended on Aug. 19, which was an increase of 3,639 cars compared with the preceding week. This represents an increase of 41,072 cars over the corresponding week in 1921, but a decrease of 111,884 cars compared with the corresponding week in 1920. Coal loadings during the week totaled 81,959 cars, an increase of 2,600 over the previous week.

Comparative Prices of Shop Supplies

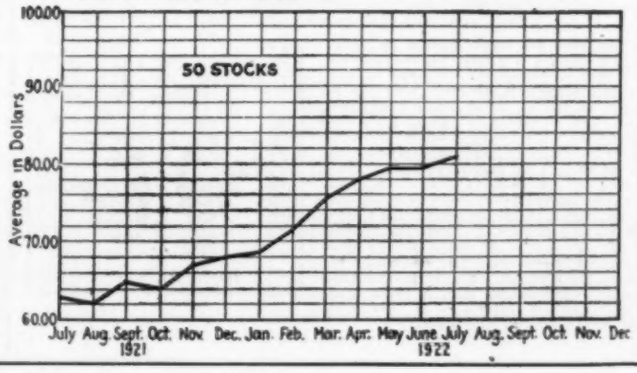
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.	$0.0280	$0.0261	$0.0270
Cold finished shafting	per lb.	0.0365	0.0340	0.0415
Brass rods	per lb.	0.166	0.1750	0.1433
Solder (½ and ½)	per lb.	0.22	0.217	0.18
Cotton waste..	per lb.	0.115	0.11	0.102
Washers, cast iron (½ in.)	per 100 lb.	4.00	3.83	4.06
Emergy, disks, cloth, No. 1, 6 in. dia	per 100	3.11	3.11	.....
Lard cutting oil	per gal.	0.575	0.575	.....
Machine oil	per gal.	0.36	0.36	.....
Belting, leather, medium	off list	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65–10%	50%@ 60–10%

Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Monthly average, 1919, 138,138 cars; 26,364 trucks.



New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.



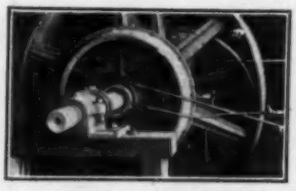
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Clutch, Friction, for Geared-Head Lathes
Greaves-Klusman Tool Co., Cincinnati, Ohio
"American Machinist," June 8, 1922

The ring of the clutch expands on both sides. The expanders are in the center of the clutch ring, operating to produce pressure directly on the toggle levers. Adjustment of the levers is by means of eccentric studs, so that the same leverage can always be maintained. The driving hub is in one piece for both the forward and reverse clutches, giving a long bearing on the shaft and a long driving key. The clutch has a 50 per cent wider face, larger diameters on some sizes, and greater belt speed than in the former model.

Clutch, Pneumatic, Dickson
Rogers Foundry and Manufacturing Co., Joplin, Mo.
"American Machinist," June 15, 1922

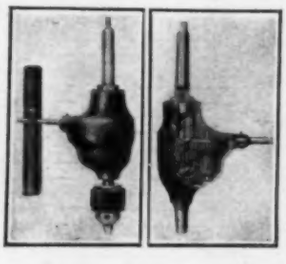


Two disks with cork-covered conical faces on their periphery are closely fitted on a hub. They are driven by pins through a triangular plate which is a part of the hub. Air can be fed through the hub between the disks while the hub is revolving. The action of the air forces the conical surfaces into contact with the outer case, which has similar conical faces. Pins in the disks are fitted with springs to release the clutch. The clutch is especially adapted to fields where remote control or clutches of large horsepower are required. The 36-in. clutch is rated at 165 hp. at 100 r.p.m., and uses air at a pressure of 3 lb. per square inch.

Grinder, Tool, Ball-Bearing
Fafnir Bearing Co., New Britain, Conn.
"American Machinist," June 15, 1922

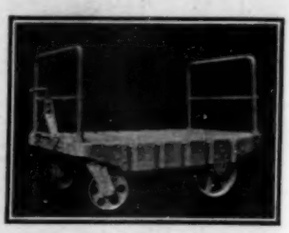
The machine may be furnished on a pedestal, or with a bracket for bolting to a post, or with a plate for bench mounting. The chief feature is the method of mounting the spindle on Fafnir ball bearings. The spindle can be driven by belt directly from the lineshaft, so that it is not necessary to start and stop each time the grinder is used. Adjustable toolrests, water pot and wheel guards are furnished.

Chuck, Tapping, Back-Geared, Single Spindle, Models E and F
Landau Machine & Drill Press Company, 45 W. 18th Street, New York, N. Y.
"American Machinist," June 15, 1922



The use of back gears in this chuck allows a much higher speed for the reversal of the tap than for the forward speed. The main drive is fitted with ball bearings and the standard tap holding chuck is used. The ratio of the reverse speed to the forward speed is 5:1 in the Model E. The chuck holds Nos. 1 and 2 Morse tapers, and has a capacity up to $\frac{7}{8}$-in. taps. The Model F is similar to the Model E, but the speed of the reversal is three times the forward speed and the capacity is from $\frac{3}{4}$ to $1\frac{1}{4}$ in. In both models, the speed control mechanism and the clutches operate to prevent the breakage of the taps.

Trailer, Wheel and Platform
Elwell-Parker Electric Co., Cleveland, Ohio
"American Machinist," June 15, 1922

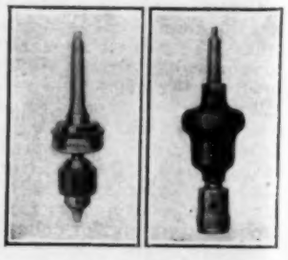


The trailer is for use with electric elevating platform trucks and tractors. The front wheels are of the swivel type, and are 10 in. in diameter. The fixed rear wheels are carried in yokes riveted to the top and to the side and are 15 in. in diameter. The trailer can be provided with end or side standards, and with a hook and eye or chain coupler. It may be equipped with four casters, or the wheels may be fitted with 10- and 15-in. solid rubber tires. The clearance between the wheels is sufficient to allow the lift truck to be driven beneath the platform. Capacity, 6,000 lb. Weight, 600 pounds.

Drilling and Tapping Machine, Sensitive, Multiple, Quick-Change
Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y.
"American Machinist," June 15, 1922

The machine provides both low and high speeds, and can be driven by means of either tight and loose pulleys or by a $\frac{1}{2}$-hp. motor. Each spindle is a complete unit, may be used individually with the remaining spindles idle, and is readily adjustable both radially and vertically. The head has a travel of $3\frac{1}{2}$ inches. Speeds: drilling, 500, 900 and 1,800 r.p.m.; reverse for tapping, 600, 1,000 and 1,800 r.p.m. Capacity: drilling, up to $\frac{1}{4}$ in.; tapping, No. 10 x 32. Maximum spindle spread, $4\frac{1}{2}$ in. Minimum center distance, $\frac{7}{8}$ in. Weight: motor-driven, 360 lb.; belt-driven, 300 pounds.

Chucks, Tapping, Plain, Models G & B
Laudau Machine and Drill Press Co., 45 West 18th St. New York, N. Y.
"American Machinist," June 15, 1922



The simple Model G friction device, shown at the left, is for holding taps so as to prevent breakage in case a hard spot is encountered in the work. It can be used with the Models B and E tapping chucks, as well as with standard tapping machines. It is made with a tapered shank for use on drilling machines and lathes, or with a straight shank and a reversing sleeve for use in a turret head. At the right is shown the Model B single-spindle tapping chuck that can be driven directly from the main spindle of a drilling machine. It is fitted with ball bearings. The spindle reverses at higher speed than when feeding downward. Capacity, up to $\frac{1}{4}$ inch.

Locomotive, Industrial, Gasoline, Motor-Driven, Atlas-Cletrac
Atlas Car & Manufacturing Company, Cleveland, Ohio.
"American Machinist," June 15, 1922

The locomotive is intended for general hauling around industrial plants and for road construction. The driving mechanism consists of the complete power plant of the Model F tractor made by the Cleveland Tractor Co. The 18-hp. motor has four cylinders, and can be run on either gasoline or kerosene. A washing device removes dust from the air fed to the motor. Reversal is accomplished by means of a jaw clutch and speed control by the throttle. A cab enclosing the mechanism and the operator can be mounted on the frame. Wheel base, 34 in. Gage, 24 in. or wider. Maximum speed, 8 m.p.h. Draw-bar pull at 4.8 m.p.h., 800 lb. Weight, 4,000 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

The Tariff Situation

WASHINGTON CORRESPONDENCE

Driving at top speed, Republican conferees on the tariff bill have considered and tentatively agreed upon more than half of the amendments to rates which were made by the Senate. Working seven hours daily, and with prospects of night sessions, the conferees have declared that their report will be submitted to Congress by the middle of September.

In making this record of speed, however, the conferees have passed over until the end of the bill all highly controversial points in the measure. The question of the basis of valuation to be used in determining ad valorem rates will not be disposed of until the last. The House used American valuation as its basis—the value of a comparable American article. The Senate used foreign valuation, which has been the basis of all previous tariff measures. In proceeding with discussion of rates, the conferees are using the Senate basis of foreign valuation, but with experts of the Tariff Commission keeping a parallel column translating such duties into terms of the American wholesale selling price of the imported article. This is the so-called Burgess plan, suggested by William Burgess, now a member of the Tariff Commission, and which was considered and rejected by the Senate finance committee when the bill first came from the House more than a year ago. If this plan finally were adopted by the conferees, it would change every ad valorem rate in the bill—and ad valorem rates constitute about 22 per cent of all rates in the bill—and would destroy any accurate basis of comparison with previous tariff laws.

VIGOROUS CONTEST EXPECTED

Nothing as to definite agreements on rates is being given out by the Republican conferees. The Democratic conferees are excluded from the sessions and no meetings are being held with reporters, as was done during conference on the tax bill.

Senator McCumber, however, has stated definitely that in the chemical schedule the conferees passed over coal-tar products, which rates were increased heavily in the Senate by the Bursum amendment, raising the figures and placing them on the basis of American valuation. He also stated that white arsenic on which the House placed a duty of 25 per cent and the Senate finance committee recommended 2 cents per pound but which was placed on the free list by vote of the Senate, had been passed over. It is expected that in the cotton schedule, the additional duty of 4 per cent imposed by the Senate upon yarns and cloths treated with vat dyes, will be passed over until the dye rates in the chemical schedule are determined.

While no authoritative information has been given out by the conferees, it is the general understanding in the corridors of both Houses of Congress that the conferees have made some reductions in the chemical schedule and in the metals schedule, the latter being in manufactured articles. The cutlery rates were passed over, it is understood.

When the conferees do take up the coal-tar rates in the chemical schedule, a vigorous contest is expected. Senator Smoot is opposed to anything like the rates imposed by the Bursum amendment. Somewhat significant of the fight he proposes to wage in the conference was the fact that on the day the bill passed the Senate, the Utah senator secured adoption of an amendment to the flexible tariff provision of the administrative section which would empower the President to make effective a change in rates of coal-tar products on 15 days notice, whereas 60 days notice is required before changes on any other products shall go into effect.

On the other hand, Senator McCumber heartily favors the high rates of the Bursum amendment, and Senator McLean, the third Senate conferee of the Republicans, voted for the high rates and is an ardent protectionist.

Republican leaders in both the House and Senate predict that the new tariff bill will be on the statute books by Oct. 1.

Strikes Retard Southern Industries

While the coal and railroad strikes are seriously retarding industrial operations over the entire Southeast, conditions in the iron and steel business are not being seriously affected as yet, according to the Southern Metal Trades Association, of Atlanta. Building operations are being somewhat retarded, as the situation has become acute in the lumber and brick industries. Many smaller lumber plants have shut down entirely, while all have curtailed production to some extent. Brick plants are being operated on a curtailed basis. There are hundreds of carloads of lumber on the side tracks in Southeastern railroad yards, and millions of brick in the brick yards that cannot be shipped because of the car shortage.

According to Robert Gregg, president of the Atlantic Steel Co., of Atlanta, the iron and steel industries of this immediate section are in very good shape with the outlook for the future better than it has been in the past three years.

The iron market at Birmingham, Ala., reached $25 the latter part of August, which, the Southern Metal Trades Association advises, is the highest price paid since the war. The lots sold at this price ranged from carloads to 200 tons, and were for spot and fourth quarter delivery. Pig iron prices for 1923 delivery are expected to be above $21 to $22 per ton for No. 2 foundry. No sales have been made as yet, however, for 1923 delivery. The present spot average is above $21. The price tendency is upward due to the strikes.

There are now 23 iron stacks active in the Alabama district as compared with 20 on July 1, and about 25 per cent that production at this time a year ago.

Production in the Alabama district the last half of the year is expected to greatly exceed that of the first six months, when official tonnage was 963,019 tons. For the last six months of 1922 production will probably double that of the same period in 1921, when the tonnage was only 548,183 tons.

Washington Notes

BY PAUL WOOTON

During July inspectors of the Interstate Commerce Commission inspected 4,085 locomotives throughout the country. Of that number only 169 were found to be in such condition as to be classed as "not safe to operate"; 2,456 disclosed defects of varied character, more or less serious, while 1,295 others possessed defects of a character such as to give cause for no immediate concern, but which, according to the best practice, should have attention. The report, called for by a Senate resolution, is a disappointment to the unions which inspired it, who expected it to disclose a much higher percentage of bad-order locomotives.

The Commission took advantage of the opportunity to present certain pertinent facts in connection with locomotive boiler inspection. As required by the act, the United States is divided into fifty locomotive-boiler inspection districts. One inspector is assigned to each district. There are 70,000 locomotives coming within the purview of the act. A determination as to the extent to which the act currently is being violated would involve ascertainment of the condition of each locomotive and information as to the use being made of it. Conditions of locomotives vary from day to day. It will be impossible for Interstate Commerce Commission inspectors to make any such determination. The 70,000 locomotives are housed or repaired at 4,600 different points and are operated over more than 265,000 miles of track. While it is obvious that it is impossible to report on the condition of all locomotives, the Commission expresses the opinion that the boiler inspection act has been recently violated. At the same time the Commission points out that it is absolutely impossible to report accurately on the extent of such violations.

The reports from the boiler inspectors of the Commission indicate, the report says, "a very general let-down in the matter of inspection by the carriers which gives cause for concern."

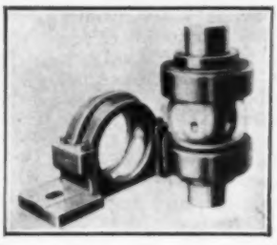
The Commission points out that it is the use of a locomotive which is not in proper condition and not the condition itself which is a violation of the law. Attention also is called to the fact that the appropriation for boiler inspection for the current fiscal year is $290,000. Of that amount, the maximum legal expenditure in any one month is $24,166.66. This was cited to show that inspectors can render only a general service, designed to bring about compliance on the part of the carriers with the terms of the act.

The hope that Mr. Ford will not find it necessary to close his plants on account of coal prices was expressed today by Secretary Hoover. He called attention to the fact that Mr. Ford has signified his willingness to pay $4.50 for coal. Mr. Hoover expressed the opinion that the price would not be greatly in excess of that figure on September 16, the date set for the closing of the Ford factories. Even should Mr. Ford have to pay $6.50 per ton for coal after the 16th, Mr. Hoover pointed out that this would not be a heavy tax on his business since at the present rate of his output the added

Condensed-Clipping Index of Equipment

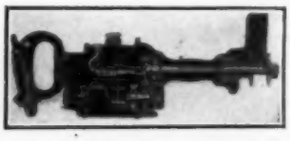
Patented Aug. 20, 1918

Pillow Block, Self-aligning, Double-Ball-Bearing
Fafnir Bearing Co., New Britain, Conn.
"American Machinist," June 15, 1922



The block is nearly frictionless, since both radial and end-thrust loads are carried by the balls. It has the minimum distance possible from the base to the shaft center, and automatically aligns without affecting the ball bearings. The outer bearing ring is mounted against a shoulder near the end of the box. The box contains no bolts, screws nor adjustments. It is secured endwise on the shaft by means of two collars fitted with setscrews and lugs which engage corresponding slots cut in the wide inner rings of the ball bearing. The block is of special use on large sizes of fans and blowers.

Grinder, Pneumatic, Portable
Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y.
"American Machinist," June 22, 1922

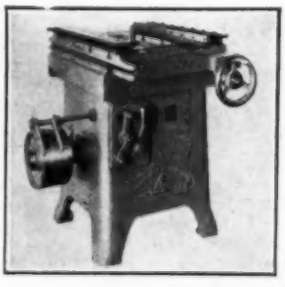


The wire brush that can be used in place of a grinding wheel makes the equipment adaptable to removing rust, paint and scale from steel and iron surfaces. An oil separator has been fitted to the grinder to hold the lubricant for the bearings. It consists of a perforated cylindrical steel shell attached to the inner end of the grinding spindle. This shell revolving around the vent tube separates the oil from the oil-laden air leaving the motor, and throws it back into the mechanism. The separator is applicable to the larger sizes of the "Little Giant" grinders.

Saw, Bench, Portable, "Rapid"
Triangle Metal Products Corp., 31 Dartmouth St., Rochester, N. Y.
"American Machinist," June 22, 1922

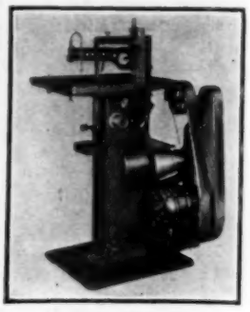
The machine is made in two sizes. A ½-hp., 110-volt enclosed motor arranged for either a.c. or d.c. drives the saw through worm gearing. The speed of the saw is ordinarily 110 r.p.m. The saw is hollow ground and is $\frac{1}{16}$ in. in thickness and 3½ in. in diameter. It is covered by a guard. The work-holding device is equipped with handles; it clamps and holds either round, square or hexagon stock. A stop for adjusting the length of the piece cut is also provided. The saws used are interchangeable. Capacity: No. 1 machine, from ⅛ to ⅝ in. in diameter; No. 2, from ⅛ to 1 in. in diameter. Weight, 40 pounds.

Milling Machine, Die, Vertical-Spindle
Billings & Spencer Co., Hartford, Conn.
"American Machinist," June 22, 1922



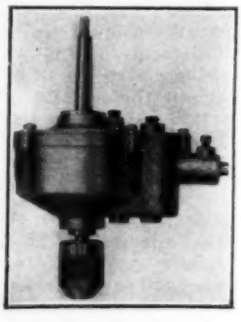
The machine is for milling dies and similar work of irregular outline. Four changes of spindle speed ranging from 281 to 926 r.p.m. are provided in the gear box and are controlled by two levers. The spindle has a lever-operated collet, and special collets are furnished for ⅜-, ½-, ⅝-, ¾-, and 1-in. diameter shanks. A double sliding carriage forms the upper part of the machine. The cross and traverse movements may be operated either independently or in conjunction. Capacity, 3½ to 17½ in. wide, any length. Carriage movement: traverse, 12 in.; cross, 4½ in. Floor space, 49 x 58 in. Weight, 2,000 pounds.

Filing Machine, High-Power, Large-Capacity
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," June 22, 1922



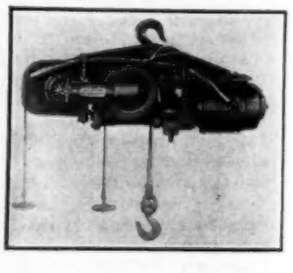
The length of the stroke is adjustable from ½ to 7 in. by means of an accessible eccentric inside the column. The table has diagonal grooves for filings and tilts for draft or clearance in all four directions. The work-clamping arm swings over the table. The head relieves the file $\frac{1}{32}$ in. on the up stroke. A pump with a swinging nozzle blows away the filings. An overhead support arm for filing closed-bottom dies, a lower support clamp for filing closed-top dies, and a sawing attachment with upper and lower arms for holding hacksaws, can be furnished. The motor required has ½ hp. at 1,800 r.p.m. Capacity, files 3 to 14 in. std. or special. Table, 20 x 24 in. Slide, 18 in. long. Floor space, 22 x 38 in. Weight, 700 pounds.

Tapping Attachment, High-Speed, Sensitive, Ettco
Eastern Tube and Tool Co., 594 Johnson Ave., Brooklyn, N. Y.
"American Machinist," June 22, 1922



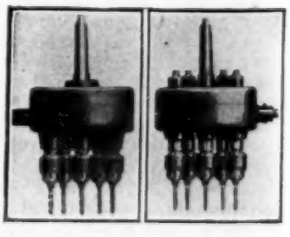
The tapping spindle is driven through friction clutches on both the forward and the reverse motion, and is fitted over a projection on the shank for most of its length. The thrust of the cut is transmitted directly back to the machine spindle. Pressure placed on the drilling machine spindle regulates the tap speed in the forward direction. As soon as the tap encounters an obstruction, the clutch slips. When the spindle is raised, the tap reverses at twice the forward speed. A special type of tap-holding chuck that gives the tap a slight play is furnished. Capacity, $\frac{5}{16}$ in. in steel and ¼ in. in cast iron or brass. Weight, 3¾ pounds.

Hoist, Electric, "Everedy" Type-S
Reading Chain and Block Corp., Reading, Pa.
"American Machinist," June 22, 1922



The hoist is intended to replace hand-power chain hoists and requires little headroom. It is light in weight and runs at high speed. A mechanical motor brake operates in conjunction with the control lever, and an adjustable automatic limit stop acts at both the bottom and top limits. The hoist is balanced, so that the lifting hook is always central with the point of suspension. The rope is guarded to prevent overwinding. The hoist may be controlled by pendant cords or by a push-button switch. It is made in sizes for lifting loads from 500 to 4,000 lb. at high speed.

Heads, Drilling and Tapping, Multiple-Spindle, Models K & H
Landau Machine and Drill Press Co., 45 W. 18th St., New York, N. Y.
"American Machinist," June 22, 1922



The Model H head, shown at the right, operates on the principle of the Models E & F back-geared tapping chucks, and has five tapping spindles equally spaced from the center. The reversal speed is four times as fast as the forward speed. Standard chucks are employed to hold taps up to ¼ in. Clutches disengage when too great a strain is placed on the taps. Shown at the left is the Model K head for drilling the holes before the Model H is used. It is similar to the Model H, although not fitted with a reversing mechanism. The drilling spindles have standard taper shanks for carrying the drills.

Clip, paste on 3 x 5-in. cards and file as desired

coal cost at very most would be $1.50 per automobile.

That the administration has at no time favored putting the Government in the coal business was indicated when Secretary Hoover declared emphatically today that the Cabinet never has seriously discussed the seizure of either anthracite or bituminous mines.

Mr. Hoover stated that no less than 25,000 cars loaded with non-union coal are awaiting movement. None of the coal mined under the drastic priority requiring one-half of all non-union coal sent to the lakes has reached the lower lake ports as yet, he declared.

There is no estimating the coal tonnage the railroads can handle under present conditions, Mr. Hoover stated. He does think, however, that they can handle enough to take care of the country's current needs.

Convention of Eleventh Annual Safety Congress

More than 3,000 safety experts registered at the eleventh annual safety congress which was held at Detroit, Aug. 28 to Sept. 1. The first day's session was preceded by four days of intensive "Safety First" campaigning by the Public Safety Bureau of the Detroit police department. During the week there were more than 230 speakers, representing industrial, public and educational forces now active in national and local safety campaigns.

Resolutions were passed by the National Safety Council advocating:

1. The safeguarding of all dangerous machinery and places according to standard methods of proved value.

2. The development of industrial equipment and processes along lines of inherent safety to eliminate accident hazards and increase production efficiency.

3. The education of all workmen and their supervisors in safe methods and habits of work.

4. The training in safety of all school children, as well as students in colleges and universities, both for their own protection and as an object lesson in good citizenship.

5. The adoption and enforcement of laws and ordinances for the safeguarding of vehicular traffic and the protection of law abiding drivers and pedestrians against the thoughtlessness and recklessness of the few.

6. The mobilization of all community forces through state and city safety councils for achieving these ends through the overwhelming force of enlightened public opinion.

A night parade of automobiles, demonstrating types of safety headlights, the annual mechanical safety exhibit, and showing of the latest traffic and accident prevention films were among the features of the convention. Better health and working conditions for industrial employees, elimination of all waste traceable to accidents, a better public safety atmosphere for all cities where traffic problems are menaces to citizens, a nation-wide appeal for more attention to the principles of safety first, and a general campaign against accidents that threaten industry, are a few of the planks in the 1923 platform.

In order that each member might be enabled to devote his time to that phase of safety engineering in which he is most interested, the meetings were divided into sections as follows: drop forge; metals; automotive; cement; chemical; mining; packers and tanners; paper and pulp; public utilities and electric railways; rubber; steam railroads; textiles; woodworking; engineering. Organization and section meetings were also held, including a meeting of the taxicab and transfer department, a special meeting for the consideration of standardization of traffic codes and signals, and a meeting of conductors, porters and yard workers of the Pullman Co., which was held at noon in the Michigan Central yards, Harry Guilbert, director of safety for the Pullman Co., in charge.

At a meeting of the executive council, the following officers were elected: President, Marcus A. Dow, general safety agent of the New York Central lines; Vice-president in charge of industrial safety, Chas. B. Auel, Westinghouse Electric Co., East Pittsburgh, Pa.; Vice-president in charge of public safety, David Van Schaak, Aetna Life Insurance Co., New York City; Vice-president in charge of sectional activities, George T. Fonda, Fonda & Tolsted, Washington, D. C.; Vice-president in charge of local councils, L. A. De Blois, Delaware Safety Council, Wilmington, Delaware; Treasurer and chairman of finance committee, Homer Niez, Commonwealth Edison Co.; managing director and secretary, Wm. H. Cameron.

The Coal Strike Situation

WASHINGTON CORRESPONDENCE

Principle emphasis is being placed by those opposed to legislation looking to the control of coal prices and distribution on the argument that such control no longer is needed. Many law makers are of the opinion that the situation is such that it can take care of itself. Those who favor the legislation might be willing to accept the argument if they were sure that the railroads could function at a high rate of efficiency. With the uncertainty as to railroad operation, however, they contend that this control must be established. They contend that at the end of price control in 1919 everyone was confident the situation would take care of itself but they point to the profiteering in coal in 1920 as a glaring instance wherein the Government did not function in the protection of the public. They think the country is in much the same frame of mind now but they deprecate statements intended to create a false sense of security at this time.

They point out that the emergency will not have passed until coal starts moving to the northwest at the rate of one million tons a week; until prices show a definite downward tendency and until the anthracite mines are in operation and careful attention has been given the problem of substitution for that portion of the anthracite production which cannot be made up. Before the situation can improve very rapidly, it is believed, the railroads must be in a position to transport nine million tons of bituminous and one million seven hundred thousand net tons of anthracite per week. Theoretically at least all stocks of coal now have been wiped out. Whatever stocks there may be are known to be negligible and too low to enter the Winter with safety.

Business Items

The Pawling & Harnischfeger Co., Milwaukee, announces the appointment of the Seifreat-Woodruff Co., with offices at Dayton and Cincinnati, as its machine tool representative, covering the lower section of Ohio, with counties bordering the Ohio River in the State of Kentucky.

The Worthington Pump and Machinery Co., Holyoke, Mass., reports that its Deane Steam Pump plant had a more successful month in July than in any other month since October, 1920. A full force, it is expected, will be employed within a short time.

The Bay State Tap and Die Co., of Mansfield, Mass., has recently purchased the plant of the Blanck Twist Drill Co., at Taunton, Mass., and will utilize same as a branch plant.

The West Point Iron Works, operating a large foundry and machine shop at West Point, Ga., announces the establishment of a branch district office at Columbus, Ga., 19 Thirteenth St., in charge of J. P. BRADFIELD.

The McWane Cast Iron Pipe Co., a new corporation formed in Birmingham a few months ago, following the purchase recently of an extensive acreage in the eastern part of the city, makes the announcement that construction of a new plant will begin at once. The company has been operating in the plant of the Southern Pipe and Foundry Co. The new plant will have a capacity of 8,000 feet of pipe daily, and will be ready by March of next year.

The Chicago Railway Equipment Co., Grand Rapids, Mich., has arranged for an increase in capital from $2,500,000 to $3,000,000.

The Westfield Machine Co., Westfield, Mass., suffered a loss of $10,000 by a fire which swept their factory on Aug. 15. Part of the plant was used for the making of radio apparatus, and much completed stock in the department was destroyed.

The Lucey Manufacturing Co., of Texas, has recently opened new headquarters for the State of Texas, at 1514 Magnolia Building, Dallas, Tex., according to Clyde V. Wallis, of the Chamber of Commerce of that city.

The Ashtabula Steel Co. has started fifty per cent operations with its new plant at Ashtabula, Ohio. The company has eight mills for the production of sheets, specializing in black and galvanized, 12 to 30 gage. ROBERT LOCK is president.

The Pawling & Harnischfeger Co., Milwaukee, announces that it has appointed the Cleveland Duplex Machinery Co., Cleveland, Ohio, G. J. HAWKEY, president, as its Cleveland representative, for its line of machine tools in the northern section of Ohio.

The C. A. Spotz, Inc., 41 Bank Street, Stamford, Conn., recently incorporated under the laws of Connecticut, to engage in the manufacture and deal in machinery, tools, etc., organized the past week, electing the following

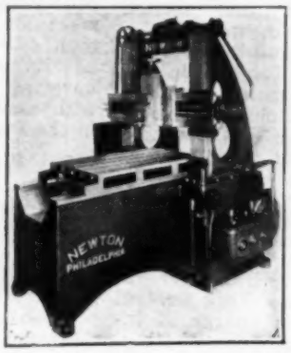
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Planer, Crank, Heavy-duty, Short-stroke

Newton Machine Tool Works, Inc., Philadelphia, Pa.

"American Machinist," June 22, 1922

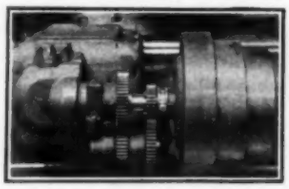


The machine is made with either one or two heads on the crossrail. It holds work 32 in. high and 32 in. wide. The length of the stroke, with 34 in. as the maximum, can be set from the operating side. Speeds of from 6 to 35½ strokes per min. are provided by the gear box. The table has an adjustment of 20 in. along the bed and is controlled by a lever. The feed motion is of the double-cycle type. It operates on the return stroke of the table and gives cross, down and angular feeds. The crossrail is raised and lowered by power derived from the small vertical belt. The planer is suitable for machining die blocks, forming dies, locomotive crossheads, shoes and wedges.

Drive, Slow-speed, for Boring Mill

Cincinnati Planer Co., Cincinnati, Ohio

"American Machinist," June 22, 1922

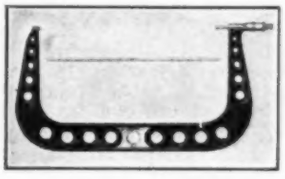


The mechanism has been developed to provide slow speed for the boring mill made by the firm. A speed as slow as ⅛ r.p.m. is obtainable. In the position shown the reducing gears are operating, and the table would move at slow speed. By sliding the small upper gear into the clutch of the larger gear, direct drive can be obtained, so as to utilize the regular speeds of the boring mill. A special cover protects all of the gearing, and also the shifter rod for sliding the gear into engagement. The arrangement makes the machine capable of both high and low speed, and does not interfere with the operation in either range.

Micrometer, "Rex"

Brown & Sharpe Manufacturing Co., Providence, R. I.

"American Machinist," June 22, 1922



The micrometers are furnished for either English or metric measure and include twenty-four sizes to take measurements up to 24 in. or 600 mm. They can be furnished either with or without ratchet stops or clamping rings to clamp the spindle and to preserve the setting. The frame is of I-section and rectangular in shape. In the larger sizes, the bends are re-inforced and holes in the web lighten the weight. The larger sized micrometers can be provided with finished wooden cases. The tools can be furnished singly or in sets.

Shear, Slitting, and Bar-Cutter, Universal

Buffalo Forge Co., Buffalo, N. Y.

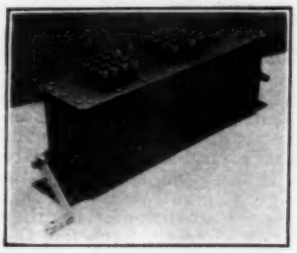
"American Machinist," June 29, 1922

The machine is intended particularly for use where a punch is not needed, as in iron shops or warehouses. The shear is equipped with 10-in. knives, which can cut either plates ½-in. thick and of any length and width, or 6 x ⅝-in. flats. The knives may be operated at the rate of thirty strokes per minute. The bar-cutter has standard five-piece knives, or special knives can be furnished. Approximately 3-hp. is required to operate the machine. Length, 5 ft. 4 in. Width, 2 ft. 8 in. Height, 6 ft. 4 in. Weight, 4,500 pounds.

Lubricator, Machine Tool, Force-Feed, Automatic

Madison-Kipp Corp., Madison, Wis.

"American Machinist," June 22, 1922



The lubricator consists of a reservoir and cover and is driven by the machine it lubricates. Fixed to the cover and working in the oil are the pumping units for measuring and forcing the oil to the feed outlets and bearings. Either four or eight positions can be lubricated from each pumping unit. The amount of oil fed can be regulated by changing the speed of the lubricator drive shaft, or each set of eight feeds can be adjusted by means of one slotted-head screw on the top of the lubricator. The drive may be of the ratchet type requiring a reciprocating motion, or by pulleys from a rotating shaft of the machine. The lubricator may have two compartments for two different grades of oil.

Flexible-Shaft Outfit, Radial-Arm

Stow Manufacturing Co., Inc., Binghamton, N. Y.

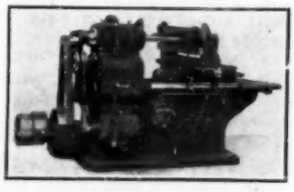
"American Machinist," June 22, 1922

A large flexible shaft is driven from a lineshaft without the use of an individual motor. The chief feature is the pivoted horizontal arm, which enables the operator to work over a large area. The outfit is adapted particularly to use in garages, repair shops and vulcanizing plants. Besides being used for grinding and buffing, it can be employed for drilling, or for operating a screwdriver. It can be supplied in various sizes to suit different classes of work.

Grinding Machine, Cylinder, No. 50

Heald Machine Co., Worcester, Mass.

"American Machinist," June 29, 1922

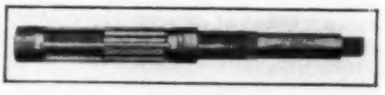


The machine may be furnished for belt or motor drive. It is more massive in construction than the former model, and has a wider work table with a 5/16-in. vertical adjustment. Power for reciprocating the table is transmitted through an hydraulically operated mechanism, giving minute speed variations of from zero to 15 ft. per minute. The rotative movement of the eccentric grinding head is derived from a belt running over a pair of three-step cones and shifted by means of a lever on the front. The cross-slide, directly upon which the work is mounted, has a movement of 28 in. at right angles to the table traverse. Floor space, 73 x 123 in. Weight, 5,000 pounds.

Reamer, Expansion, Inserted-Blade, "Mirr-O-Ream"

Samuel Hocking & Son, Lancaster, Pa.

"American Machinist," June 29, 1922



The size is adjusted by moving the blades along the slots, the depth of which decreases from the front end to the shank end of the tool. The blades are ground with a double relief, and at a greater angle near the back edge to increase the relief and prevent dragging. They are held in place at each end by "steady-rings." The tool is made in seventeen sizes, and can be furnished in sets. Smallest size: adjustment, 1/16 to 1/8 in. in diameter; length of blades, 1¾ in.; overall length, 5½ in. Largest size: adjustment, 3¼ to 4 1/16 in. in diameter; blade length, 7¾ in.; overall length, 24 inches.

Clip, paste on 3 x 5-in. cards and file as desired

officials: C. A. Spotz, of Greenwich, Conn., president; H. M. Rice, of New York City, vice-president; A. H. Emery, Jr., of Glenbrook, Conn., secretary; and Carleton Pratt, of New York City, treasurer.

The Pawling & Harnischfeger Co., Milwaukee, Wis., announces that the Cadillac Machinery Co., Detroit, C. L. CAMPBELL, president, is representing it in the machine tool line in the State of Michigan with the exception of counties bordering on Lake Michigan and the extreme northern section of the State.

The Alabama Machinery and Supply Co., Montgomery, Ala., has filed a petition requesting permission to increase its capital from $100,000 to $200,000, in order to provide for the expansion of its plant and properties during the coming year.

The International Derrick and Equipment Co., Toledo, Ohio, manufacturers of oil field machinery, has recently opened Texas headquarters in the Southland Life Building, Dallas, Tex.

The Liberty Tool and Die Corp., Rochester, N. Y., has been incorporated with a capital of $10,000. The organizers are C. F. Hallick, C. H. Meyer and F. E. Wagner, all of Rochester.

W. A. Jones Foundry & Machine Co., manufacturer of speed reducers and power transmitting machinery, Chicago, Ill., announces the opening of a branch sales and engineering office at 2482 University Ave., St. Paul, Minn., with C. F. Ford in charge.

The American Thermometer Co., Columbia, Pa., has sold its machinery and plant equipment to Harry K. Smith and John Minnick of Wrightsville, Pa., who, it is reported, will remove it to Wrightsville, where a new factory is being erected.

The Hendry Machine and Engineering Co., Fort Meyers, Fla., according to B. L. Hendry, president, expects to operate a machine shop and marine ways specializing in ship work. LANIER HENDRY is vice-president of the company, and W. F. LUSK, secretary and treasurer. The capital is $50,000.

The H. B. Smith Co., Westfield, Mass., has resumed work in its foundries after a period of inactivity lasting fifteen weeks due to a strike of the employees.

The Lamar Welding Co. has been organized in Atlanta and has taken over the plant of the Standard Gas Products Co., formerly the Bird-Wilcox Co., one of the largest welding shops in the South. John Lamar is president of the company.

The Elwood Foundry, Inc., Elwood, Ind., it is announced by Richard F. Broadbent, receiver, will be sold at a public sale at an early date. The personal property consists of electric motors, drill presses, an electric traveling crane, tools, appliances, a large quantity of machinery for tool making and office furniture.

The New York, Chicago and St. Louis (Nickel Plate) Railroad Co. has been granted permission by the Interstate Commerce Commission to issue and sell, at not less than par, $8,663,000 of its second and improvement bonds, to enable it to pay off a debt of $1,000,000 owed to the Government, to retire funded debts falling due in 1922, and to reimburse its treasury for improvements and betterments paid out of current funds.

The Illinois Tool Works, Chicago, Ill., has appointed the Commercial Steel and Supply Co., Plymouth Building, Cleveland, as its representative in the Cleveland district.

Stringer Brothers, Chicago, Ill., manufacturers of plumbing specialties and supplies, have under construction at Gadsden, Ala., an addition to their Alabama plant. Two units are being added that will increase the floor space by 7,000 square feet.

The Oliver Rim Co., Atlanta, Ga., manufacturer of automobile rims, has filed a voluntary petition in bankruptcy. W. A. Fuller, of Atlanta, has been named receiver.

The T. Murphy Iron Works, Jacksonville, Fla., through its president, Frank Murphy, announces the sale of its plant and properties to the Merrill-Stevens Drydock and Repair Co., also of Jacksonville. The Murphy company was originally founded in 1880.

The E. L. Gee and Co., Nashville, Tenn., advise that due to a steady improvement in recent months in the sale of machinery supplies, machinery, etc., over the southeast, it has been found necessary to practically double capacity of its plant.

The New Britain Hardware Manufacturing Co., New Britain, Conn., has incorporated under the laws of Connecticut to engage in the manufacture of all kinds of cutlery, hardware, small tools, etc. The concern will be capitalized at $10,000, and the incorporators are: Anthony Perzanowski, John Kulesza and Alex Hermanowski, all New Britain men. The concern will operate a plant on Washington Street, New Britain.

The Reeves Pulley Co., Columbus, Ind., announces the appointment of Manning, Maxwell & Moore, Inc., 99 Chauncey St., Boston, Mass., as its agent for the New England territory. A complete and separate variable speed department has been installed, and a large stock of variable speed transmissions, as well as parts, will be carried.

The Springfield Ornamental Iron Co., West Springfield, Mass., has entered upon active production at its plant, turning out ornamental steel and bronze work. G. G. Gerke, 26 Maple Terrace, Mittineague, Mass., is head of the corporation, which has a capital of $20,000. Associated with him is G. Olsen, former owner of the Worcester Ornamental Works, O. W. Peterson and Alden Carlson.

The Chamber of Commerce, Birmingham, Ala., has announced an unusual plan to be carried out during the coming year to advertise the industries of that city. Full page ads will be devoted to each of the separate businesses or industries that are included in the membership of the chamber. For instance, there will be one advertisement of the iron and steel industries, one of the general machinery and supply business, etc.

The Scheid Engineering Corporation, 90 West Street, New York City, has been appointed metropolitan and export representative for the Franklin Moore Co., Winsted, Conn., manufacturer of material handling machinery for industrial plants.

Chas. Eisler, Newark, N. J., has moved his factory and offices from 15 Kirk Alley to 756 S. 13th St., where he has a well-equipped factory containing 6,000 sq.ft. of floor space in a modern brick building recently put up at a cost of $30,000.

The Buol Machine Co., 168 Arch St., New Britain, Conn., is now being organized to engage in the manufacture of special machinery and to conduct a general machine business at the address mentioned. ABRAHAM BUOL, for many years connected with the New Britain Machine Co., as superintendent, is the directing head of the new concern.

The Hartford Valve Manufacturing Co., of Hartford, Conn., recently incorporated under the laws of Connecticut, to engage in the manufacture of valves, heating appliances, etc., organized the past week by the election of the following officers: Mitchell S. Little, president; Michael H. Flynn, secretary and treasurer. These two, together with H. Bissell Carey, form the board of directors.

The Pacific Development Co., New York City, for the year ended Dec. 31, 1921, reports a total income of $514,779 and a deficit of $6,547,239 after writing off bad debts.

The Union Hardware Co., manufacturer of hardware, small tools, etc., of Torrington, Conn., filed a certificate with the Secretary of the State of Connecticut during the week, increasing the company's capital stock from $600,000 to $2,100,000.

The Dawson Variety Co., Dawson, Ga., suffered a loss of several thousand dollars, caused by a fire which completely destroyed its machine shops on August 10.

The Hunter Saw and Machine Co., Pittsburgh, Pa., announces that it has opened an office in the Manhattan Building, Chicago, Ill., where they will carry a complete stock of metal cutting circular saw blades, as well as pneumatic hammer rivet sets and chisel blanks. Paul W. Wendt will be in charge.

The M. S. Little Manufacturing Co., 151 New Park Ave., Hartford, Conn., and the A. J. Beaton Manufacturing Co., of New Britain, Conn., both manufacturers of plumbing and heating tools, specialities, etc., will on September 6th, merge into one company, using the name of the M. S. Little Manufacturing Co. The machinery and stock of the Beaton concern will be removed to the Hartford plant of the Little Manufacturing Co., and the Beaton Co. will be dissolved. Lack of space for expansion of the A. J. Beaton Company is given as the main reason for the consolidation of the two companies.

The Diamant Tool and Manufacturing Co., Inc., 91-97 Runyon St., Newark, N. J., has appointed Samuel W. Hay's Sons, 1410 Keenan Building, Pittsburgh, Pa., its exclusive representative in connection with the sale of Diamant standard punch and die sets,

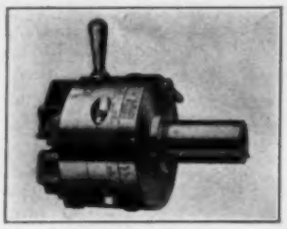
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Diehead, Automatic

Landis Machine Co., Waynesboro, Pa.

"American Machinist," June 29, 1922



The device can be used on practically all makes of turret lathes and hand screw machines. Chasers are supported on the face of the head, and are easily removable. The head employs the regular Landis flat chasers and can be furnished in styles and sizes of shank to suit requirements. It is automatically opened by retarding the forward motion of the carriage, and is closed by hand. The correct sizes for the roughing and finishing cuts are obtained on the 1¼-, 2- and 3-in. heads by the movement of the lock-pin lever. The cutters are adjusted by means of an adjusting screw to give the proper diameter of work. Each head is graduated for all sizes within its range of bolts, and provides for both right- and left-hand threads and right-hand pipe threads.

Threading Dial, "E-Z"

James M. Colven, 20 Wolffe St., Yonkers, N. Y.

"American Machinist," June 29, 1922

The dial is for attachment to lathes doing threading work. It is shown both attached to and separate from a lathe carriage. Only two screws are used in securing it to the carriage. The device consists of a cast-iron bracket carrying a brass sleeve, a brass dial, steel shaft and a brass worm gear suited to the pitch and thread form of the lead screw on which it runs. The dial can be used when cutting threads having a fractional number of turns per inch. The dial aids in working close to a shoulder or boring to depth. When a lathe is equipped with the dial, it is not necessary to have a reversing belt.

Gages, Micro, Cylinder and Piston-Ring

Stevens and Co., 375 Broadway, New York, N. Y.

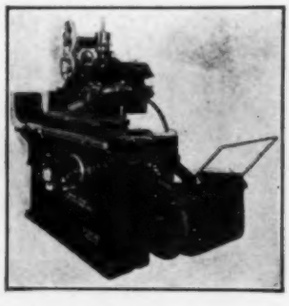
"American Machinist," June 29, 1922

The cylinder micro-gage shown at the left, consists of one fixed pin and one adjustable pin mounted in a holder. The combined lengths of the two pins equal the standard diameter of the cylinder, and a thickness gage can be inserted between the two pins to measure an oversize. A thickness gage can be furnished. The ring gage shown at the right is for use in fitting piston rings. A ring is fitted to the engine cylinder, and then placed in the ring gage, and the opening measured by a thickness gage. By duplicating the measurement for all the rings, correct fits can be obtained. The device can be furnished in standard sizes and over-sizes for any make of car.

Grinding Machine, Surface, Open-Side, 6 x 10 x 36-In.

Norton Co., Worcester, Mass.

"American Machinist," June 29, 1922

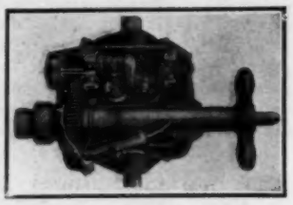


The spindle is provided with flood lubrication and thumbscrew adjustments for both radial and end thrust. The wheel spindle, driven by a 15-hp. motor mounted at the rear, runs at 1,342 r.p.m. The table runs at a speed of 80½ ft. per minute. The hand traverse mechanism engages automatically when the power traverse is disengaged. The cross-slide has two hand-operated feeds with a ratio of 1 to 38. The vertical feed of the wheel can be power operated. A feed of 0.00025 in. is given for each graduation on the index wheel. Grinding wheel, 10 x 3 in., 3-in. bore. Height, 6 ft. 3 in. Floor space, 10 ft. 8 in. x 5 ft. 3 in. Weight, 6,500 pounds.

Drill, Pneumatic, Hand Portable

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

"American Machinist," June 29, 1922

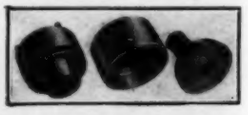


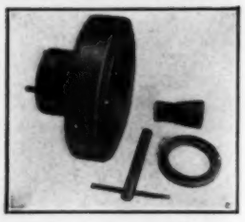
An oil vent that is applicable to most sizes and types of the "Little Giant" pneumatic drills is attached inside the drill. It consists chiefly of a sliding plunger conical at each end that prevents oil leakage. The piston and connecting rod units or toggles are made interchangeable in the drill, and can be assembled and disassembled without dismantling the entire drill. The connecting rod is fitted to the piston by means of a ball and socket joint. Two of them are secured in place on each crankpin by means of hinged split collars which provide a large opening for the lubricant to reach the crankpin bearings. The mechanism is 30 per cent lighter in weight than the former model.

Chuck, Combined Collet and Step

Hartford Special Machinery Co., Hartford, Conn.

"American Machinist," June 29, 1922



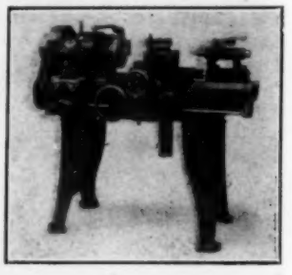


The chuck is intended for use on lathes and similar machines not provided with a through hole in the spindle, and for use also where a drawbar is undesirable. It is equipped with small collets and step chuck, shown in the top view, and with a large closing ring and step collet, shown below. The same body is used for either combination, and is screwed to a small faceplate fitted to the spindle nose of the machine. Internal collets are provided to hold all commercial sizes of round stock up to 1 in. in diameter. Two sizes of closing rings are furnished with the chuck, and the larger size holds work up to 8 in. in diameter.

Lathe, Heavy-Duty, Rapid-Production, 11-in.

R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

"American Machinist," June 29, 1922



The headstock is of the selective speed type, and provides six speed changes of from 50 to 250 r.p.m. controlled by two change levers. The spindle has a large hole for holding work and for mounting draw-in or expansion chucks. A plain block rest and toolpost are provided and a turret toolpost can be furnished. The feed box is of the automobile change-gear type, and provides nine feeds from 0.008 to 0.092 in. per revolution controlled by two levers. Capacity: diameters, up to 13¾ in.; lengths, up to 18½ in. Bed length, 4 ft. Weight, 1,340 pounds.

Drill Gage and Holder, "Quikbak"

Harry Faltermayer, 1615 Sansom St., Philadelphia, Pa.

"American Machinist," June 29, 1922

The device has holes in which straight-shank twist drills can be held vertically, and a tapered V-slot for measuring their size. An etched brass plate with raised markings forms the cover plate. The drill shank is inserted in the slot and then moved down as far as possible toward the small end of the V. The guide line at the point where the drill stops leads to the proper hole, which is marked with both the drills' gage number and size in decimals of an inch. On the front side of the slot is a scale graduated in thousandths of an inch on which the diameter of the part inserted in the V can be read. Bench space, 13½ x 3½ inches.

Clip, paste on 3 x 5-in. cards and file as desired

in the territory covered by the counties of Allegheny, Westmoreland, Washington, Armstrong, Indiana, Cambria, Somerset, Fayette and Beaver in the state of Pennsylvania.

The Apex Electrical Manufacturing Co., Cleveland, Ohio, has purchased factory site at East 75th Street and Bessemer Ave., for the motor division and foundry department.

Personals

J. H. CONNOLLY, formerly plant engineer of the Remington Arms and Ammunition Co., Bridgeport,, Conn., and later vice president and production manager of the N. C. L. Engineering Corporation, of Providence, R. I., has been appointed general manager of the Standard Machinery Co., of Auburn, R. I.

J. L. STONE, sales manager of the Elgin Machine Tool Co., has resigned to accept a position on the sales staff of the Thermalene Gas Corporation, Kankakee, Ill., in Chicago and vicinity.

W. IRVING BULLARD, vice-president of the E. H. Jacobs Manufacturing Co., manufacturers of mill supplies, Danielson, Conn., will sail September 30, for Brazil, where he will attend the International Centennial Exposition at Rio de Janiero as a delegate of the states of Connecticut and Massachusetts, as well as for the American Bankers Association, National Association of Cotton Manufacturers, and the National Council of the American Cotton Manufacturers. Mrs. Bullard will accompany him, as will his son and daughter.

H. J. SWANSON, formerly sales manager of the Detroit Machine Tool Co., manufacturers of the Detroit centerless grinding machine, resigned from that position on Sept. 1, and has accepted the position of general sales manager with the Peerless Machine Co., Racine, Wis., manufacturers of the Peerless universal shaping saws. Mr. Swanson's connections with the Detroit Machine Tool Co. extended over a period of six years. His work included the positions of machine designer, road work and sales manager.

R. R. JONES, chief engineer of the Firestone Tire and Rubber Co., has been named chairman of the Akron section of the American Society of Mechanical Engineers. J. C. SPROULL will serve as vice-chairman of the Akron section while W. R. GILLIAM will act as secretary.

ROBERT C. YATES, well known in the forging industry and for many years identified with the Union Drop Forge Co. of Chicago, has resigned to become general manager of the Interstate Drop Forge Co. of Milwaukee. Mr. Yates was formerly connected with the American Locomotive Co. at Schenectady, and the Bethlehem Steel Co., as manager of the Chicago district office.

W. J. HOWARD and G. T. KEY, JR., both of Montgomery, Ala., have organized the Standard Electric Machine Works and established a plant in that city at Coosa and Bibb Sts. Mr. Howard has been chief engineer for the Durham Public Public Service Co., Durham, N. C., while Mr. Key has been master mechanic with the American Agricultural Chemical Co. The new company will specialize in heavy electrical construction work.

JOHN J. CURRY has been appointed mechanical superintendent of Plant D, of the New Departure Manufacturing Co., Meriden, Conn.

W. B. STRAHAN, West Palm Beach, Fla., suffered a loss of $10,000 a few days ago in a fire which destroyed his machine shops in that city.

D. C. GRIFFITHS, formerly with the M. B. Austin Co., and D. B. GRAZE, a specialist on power apparatus, have opened offices in the Marshall Building, Cleveland, Ohio, as manufacturers' agents, to handle the distribution of electrical material in the State of Ohio, for the M. B. Austin Co., Appleton Rubber Co., and portions of the state for the S. H. Couch Co., Inc.

E. F. LINDGREN has been named manager of the southeastern plant of the Air Reduction Sales Co., Birmingham, Ala., succeeding H. G. BOYNER. The company recently moved its plant from Atlanta to Birmingham where a new plant is being established.

Obituary

HOWARD C. NOBLE, president of the North & Judd Manufacturing Co., New Britain, Conn., manufacturers of hardware, tools, etc., died at the Hartford Hospital, Aug. 24, 1922. Mr. Noble was born in Kent, Conn., Oct. 13, 1851, and entered the employ of the North & Judd Manufacturing Co., when twenty years of age, as a bookkeeper. He rose steadily through various offices in the company, being treasurer and vice-president, until he was elected the president in July, 1918. Mr. Noble leaves a wife, a son, and two daughters.

Book Reviews

Machine Tool Operation, Part II. By Henry E. Burghardt. 438 pages, 4¾ x 7¼ in. Amply illustrated with halftones and line drawings. Published by the McGraw-Hill Book Co., Inc., New York City. Price $2.75.

As in part one, this book gives information to the apprentice and the student of trade schools and similar educational institutions which will enable him to do machine work intelligently and which will assist him in becoming a real machinist.

The book is written in language which can be understood by any boy who has learned to read. Simple terms are used and everything is explained in a plain and straightforward manner and without the use of mathematics.

The first part, the one devoted to drill presses and drilling, is particularly meritorious and complete. As we go further into the book we find that this completeness tapers down somewhat. The chapters on shapers and planers are perhaps of a somewhat lower order than those on drilling and milling, but this is merely a matter of comparison. We should not say that the chapters on planers and shapers are less good, but that those on drilling and milling are better.

Every boy who desires to become a machinist, and with due respect for most finished machinists, every man who works in the machine shop, can gain by reading this book. It should be remembered, however, that the book should not be read like a novel but that every chapter and every part should be studied and carefully digested.

Trade Catalogs

Core Oven Equipment. The Whiting Corporation, 945 Monadnock Block, Chicago, Ill. A new publication, known as catalog No. 163, containing 23 pages. This catalog is descriptive of the company's line of core oven equipment for foundry work and contains numerous illustrations showing typical installations as well as useful general information regarding core ovens, racks, bricks, etc.

Trucks and Turntables. The Whiting Corporation, 945 Monadnock Block, Chicago, Ill. A new publication, known as catalog No. 164, containing numerous illustrations and descriptive matter on the company's extensive line of trucks and turntables for foundry, shop yard, and other industrial uses.

Milling Machines. The Ingersoll Milling Machine Co., Rockford, Ill. A special folder containing eight special illustrations showing impeller bodies for blowers being milled accurately in four passes, as well as the tools and set-up used in accomplishing the work.

Ladles. The Whiting Corporation, 945 Monadnock Block, Chicago, Ill. A new publication, known as Catalog No. 161, of 31 pages. The catalog contains complete information with numerous illustrations of the company's extension line of ladles for all classes of foundry work with suggestions as to operation and maintenance.

"Once Upon a Time." The Copper and Brass Research Association, 25 Broadway, New York City. "Once Upon a Time" is the title of a picture-playlet in seven scenes just issued by the Copper and Brass Research Association for distribution among home-owners. The first "scene" shows a man and wife selecting a building site, following which is a scene showing the debate with the architect where the substitution of inferior metals for brass and copper is decided upon. The resulting rust-loss and inconvenience are depicted in a series of scenes indicating the effect on piping, leaders and gutters and roof. The last scene shows the house "for sale cheap," following which is a diagram of a "real house" which the home-owner then built himself, showing 14 places where copper and brass should be used in building.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Annual convention, Sept. 11 to 15 at the new auditorium, Cleveland, Ohio. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

American Institute of Mining and Metallurgical Engineers, annual convention, Sept. 25 to 28, 1922, San Francisco, Cal. Secretary, F. F. Sharpless, 29 West 39th Street, New York City.

American Society of Mechanical Engineers, regional meeting, Sept. 25, 26 and 27, 1922, Hotel Kimball, Springfield, Mass. Secretary Calvin W. Rice, 29 West 39th Street, New York City.

American Society for Steel Treating. Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

American Gear Manufacturers' Association. Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

American Manufacturers Export Association annual convention. New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Buck Falls, Pa., (Delaware Water Gap).

National Machine Tool Builders' Association. Annual convention, New York City, October, 1922. Secretary, E. F. Du Brul, 817 Provident Bank Building, Cincinnati, Ohio.

National Founders Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922. Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street. New York City.

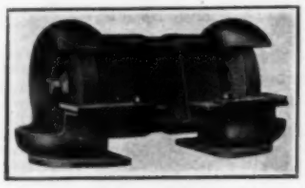
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Grinder, Flat-Front Motor, Bench, Model 76

Forbes & Myers, 172 Union St., Worcester, Mass.

"American Machinist," June 29, 1922

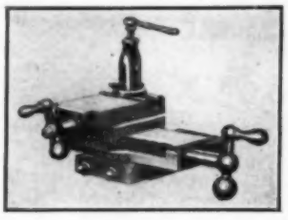


The squirrel-cage induction motor has windings on the back of the stator only. It has ½ hp. and can be operated on either two- or three-phase, 60-cycle current of 110, 220, 440 or 550 volts. The 6-inch wheels project 1¼ in. beyond the front of the motor, so that three-fourths of the abrasive can be worn down before the wheel is even with the front of the motor. Flat tool-rests adjustable in two directions are mounted on the front of the machine. A stand can be furnished to raise the spindle 40 in. above the floor. Spindle: diameter, ⅝ in.; height above bench, 4¼ in. Weight: bench type, 35 lb.; with stand, 140 pounds.

Slide Rest, 11-In.

Milliken Machine Co., West Newton, Mass.

"American Machinist," June 29, 1922



The rest is for lathe use and can be swiveled or held firmly in position. A tapered hub on the rest fits in a tapered hole in the base, and a sliding segment is clamped by means of two collar screws. The feed screws have 10-pitch square threads. The swivel is graduated, and a standard toolpost is provided. All bearing surfaces are scraped, and the rest is finished all over. A lateral travel of 5⅝ in. and a cross travel of 2½ in. are provided.

Grinder, Belt, Bench-Type

Coats Machine Tool Co., Inc., 110 W. 40th St., New York, N. Y.

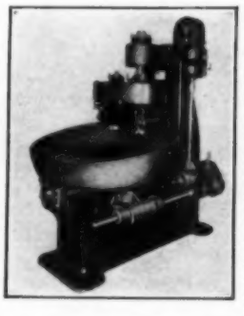
"American Machinist," June 29, 1922

The grinder is used for finishing flat surfaces on small metal parts and castings. It carries a jointless woven abrasive belt 4 in. wide and 36 in. long that travels over a flat table 10x5½ in. in size. A positive motion of the front band pulley is obtained by means of two nuts. The loose pulley is reduced in diameter, releasing the strain on the driving belt when the machine is not running. It runs on a cast-iron sleeve extending from the base castings. The detachable, graduated, work rest or back-stop can be swung through 45 deg. to either side. Weight, 60 pounds.

Milling Machine, Continuous, Rotary-Table, 30-In.

Newton Machine Tool Works, Inc., Philadelphia, Pa.

"American Machinist," June 29, 1922

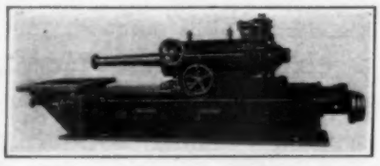


The machine is ordinarily equipped with two spindles mounted on the same head, but it can be supplied with one. The tub or chip guard for the table can be furnished for use with coolant. The machine can be driven by a single pulley, or by a 7½-hp. motor running at 1,200 r.p.m. and mounted at the top. The distance of the rotary table from the spindle can be adjusted. Two types of feed motions are provided for the table, one continuous and one with an intermittent feed and rapid traverse. The feeds and speeds are varied by means of removable change gears. Cutters up to 10 in. in diameter can be employed.

Grinding Machine, Internal, Cylinder, Automatic, M.S.O., Type FX-10

Marburg Bros., Inc., 90 West St., New York, N. Y.

"American Machinist," June 29, 1922

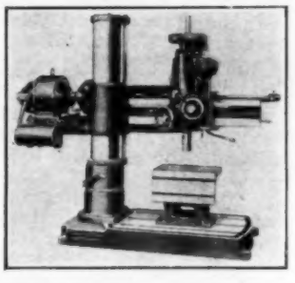


The work remains stationary while the grinding head is reciprocated automatically. The head slides on the bed and is moved longitudinally by automatic feed, while the speed is changed by means of cone pulleys. The spindle both rotates around its own axis and revolves about another axis parallel to its own, the eccentricity being adjustable either automatically or by hand. Interchangeable grinding spindles and spindle arms are furnished, and an exhaust fan and flexible hose for removing the dust from the cut. The machine is built in seven sizes for grinding cylinders of from 1 to 2 in. up to 32 in. in diameter, and of lengths up to 80 in. The larger sizes of the machine are for use on steam engine cylinders.

Drilling Machine, Radial, Motor-on-Arm Drive

Morris Machine Tool Co., Cincinnati, Ohio

"American Machinist," June 29, 1922



The motor is mounted on an extension at the back of the swinging arm, which construction simplifies the drive mechanism, balances the weight of the head, and makes it easier to raise and lower the arm on the column. The elevating mechanism is in operation only when the arm is being raised or lowered. The vertical screw is stationary. A safety mechanism disengages the clutch when the arm has reached the upper and lower limits of travel. The controller is mounted below the motor within easy reach. The head has spindle speeds of 26 to 450 r.p.m. and is of the same style as that of the standard drilling machine.

Gage, Piston, Aligning

Stevens & Co., 375 Broadway, New York, N. Y.

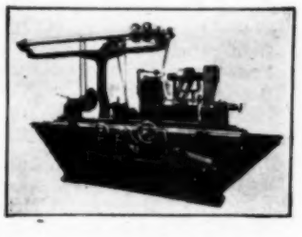
"American Machinist," June 29, 1922

The gage is for use in aligning automotive pistons on their connecting rods, and is for mounting on a bench. Any twist or bend in the connecting rod can be detected by fitting the large end of the rod on the arbor and placing the piston against either the edge or the flat side of the vertical straightedge. The device serves also for trial fitting the connecting-rod bearings on the crankshaft. Arbors can be furnished for any size of bearing required, and weigh from 6 to 8 lb., depending on the size. Height, 19 in. Weight, 19 pounds.

Grinding Machine, (Re-), Autopart, 18x72-In.

Norton Company, Worcester, Mass.

"American Machinist," June 29, 1922



This machine provides a greater capacity than the standard 18x55-in. machine, and is applicable to a greater variety of work. The dimensions of the wheelslide, headstock, footstock and other principal members are the same as in the other model. The machine has a power-driven table traverse, and is arranged for drive by belt from a lineshaft or from a motor placed in the rear of the machine. It can be adapted to all sorts of cylindrical grinding.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Kan., Wichita—The Auto Repairing & Machine Wks., 614 East Murdock St., B. M. Dawson, Purch. Agt.—one drill press (power).

Kan., Wichita—J. C. Conley, 623 Murdock St.—power lathe, drill press, emery stand, shafting, pulleys, hangers, bearings and small tools for machine shop.

Kan., Wichita—De Long Machine Co., 705 East Murdock St., J. F. De Long, Purch. Agt.—lathe, power drill press, emery stand, cutters, grinders for automobile cylinders (used).

Kan., Wichita—G. Humphrey, 625 East Murdock St.—drill press, lathe, emery stand and small tools.

Mass., Boston—The Boston Sand & Gravel Co., 88 Broad St., P. F. Ayer, Secy.—additional equipment for machine shop under construction at East Boston.

Mass., Boston—T. Noonan & Sons Co., 38 Portland St., manufacturer of barbers' supplies—one engine lathe 12 or 14 in., with full equipment (used).

Mass., Norfolk Downs (Boston P. O.)—W. A. Hiscock, machine shop—one pair 4 or 5 ft. x 15 or 18 in. gap power shear, 10 gauge capacity (used).

Mich., Wyandotte—The All Metal Products Co., 12th and Sycamore Sts.—three No. 1 Townsend riveting machines.

Minn., Albert Lea—A. R. Jensen—complete machinery equipment for auto repair shop.

Minn., St. Paul—H. Slawik, 1730 Marshall Ave.—equipment for auto repair shop under construction.

Mo., Joplin—Inter-State Billiard Supply Co., 413 Main St., E. E. Johnson, Purch. Agt.—power lathe.

N. Y., Brooklyn—The Imperial Hardware Mfg. Co., 511 Flushing Ave.—one No. 19 Bliss press, also small rolling machine for rolling U shaped channels.

N. Y., Brooklyn—J. G. Knight & Co., 1034 Dean St., electrical goods—one No. 5 V. and O. geared press with 4 in. stroke.

N. Y., Elmira—Bolton Motor Co., 125 Railroad Ave.—machinery and equipment, incl. tools for large modern auto service station under construction.

N. Y., Elmira—Goldsmith Tire & Service Co., 214 Baldwin St., J. T. Goldsmith, Member of Firm—machinery and equipment for proposed addition to tire and repair station.

N. Y., Jamestown—General Metalsmiths Inc., 313 Prendergast Ave., B. C. Davis, Mgr.—complete machinery and equipment for factory for the manufacture of architectural, mortuary and industrial bronze and copper products.

N. Y., Lockport—Bd. of Educ., East Ave. —complete metal working machinery and equipment for shop in Chestnut St. School.

N. Y., Rochester—W. Gray, 17 Carlton St.—one medium sized drill press.

N. Y., Syracuse—The Globe Malleable Iron & Steel Co., East End, H. E. Elmer, Treas. and Genl. Mgr.—machinery and equipment for proposed addition to plant for the manufacture of special patented fuel oil engines.

N. D., Williston—Monroe Bros., auto repair shop—one arbor press.

O., Lima—The Lima Locomotive Wks., South Main St.—eight 6 ft. radial drilling machines; one 90 in., one 42 in., one 36 in. and one 20 in. vertical boring mills; also one 20 in. x 10 ft. axle lathe.

O., Lisbon—National Razor Mfg. Co.—machine shop equipment for proposed shop.

Pa., Bareville—J. W. Miller—machinery and equipment for proposed auto radiator and metal works shop.

Pa., Ellwood City—Ellwood Steel Corp.—wire drawing and nail machines, for the Sharon Pressed Steel Co., recently purchased.

Pa., Phila.—Bd. of Educ., 19th and Chestnut Sts., M. Savage, Dir. of Supplies —three speed lathes, 2 for 12 in. and 1 for 43 in. woodwork; 2 engine lathes, 10 in. swing, 24 in. centers; one 3 jaw chuck, and one 4 jaw chuck; 1 drill press ½ in. (all motor connected).

Pa., Phila.—H. Kaiser & Co., Inc., 23rd and Race Sts.—metal working machinery for auto body factory, dies, presses, cutters, etc.

Va., Richmond—McMichle & McMahon, 4 South 5th St.—power pipe threading machine for heating and plumbing.

W. Va., Wheeling—Centre Fdry. & Machine Co., 2011 Main St.—additional tools for plant Warwood, W. Va.

Wis., Marinette—H. A. White, 2000 Hall Ave.—machinery for auto repair shop.

Wis., Prescott—J. A. Miller—equipment and machinery for auto repair shop (proposed).

Machinery Wanted

Ark., Poyen—A. B. Cunningham—equipment for sawmill and power house.

D. C., Washington—The International Shoe Heel Corp.—machinery and equipment for proposed branch plant in Aylmer, Ont.

Ill., Chicago—Van Housen's Favor Co., 81 West Lake St. and 189 North Clark St., T. Van Housen, Purch. Agt.—one power cutter.

Ind., Brazil—A. E. Warde—equipment for job printing.

Ind., Evansville—The Speedy Photo Co., Box 178—one multicolor printing press.

Kan., Wichita—W. H. Osborn, 1065 North Waco St.—power press.

Kan., Wichita—M. Quinius, 209 Sedgwick St., printer—one job printing press (power).

La., Bunkie—The Bunkie Record (newspaper)—one power cylinder press.

Minn., Federal Dam—O. B. Poore, saw mill products—short log sawmill or regular saw mill, or parts of saw mill, such as headblocks, setworks, carriage, saw mandril, feedworks; also engine lathe, 8 to 10 in. swing, 4 to 6 in. bed.

Mo., Joplin—Machinery & Supply Corp., Joplin St., machine shop—two 75 hp. electric hoists, one 150 hp. Bessemer gas engine, one 65 hp. Bessemer gas engine, two 801 ft. Chicago pneumatic compressor, one 100 hp. Fairbanks-Morse Y oil engine, 25 cycle, 2,200 volt motors.

Mo., Mountain Grove—Mountain Grove Laundry—washer, extractor, belting and hangers for laundry.

Mo., St. Louis—Gruenwaelders Print Shop, 720 Pine St., A. Gruenwaelder, Purch. Agt.—one 7 x 11 ft. or 8 x 12 ft. power job press.

N. J., Trenton—The Bergougnan Rubber Co., J. Grenier, Vice Pres.—vulcanizers and other rubber making machinery for curing and mill departments.

N. Y., Buffalo—Dynamo & Motor Exchange, 41 Court St.—equipment for motor and electrical repair shop, at 45 Elm St.

N. Y., Buffalo—The Sikes Chair Co., 500 Clinton St.—some new machinery for factory partially destroyed by fire.

N. Y., Clarence—Bd. of Educ.—machinery and equipment for vocational department in proposed school.

N. Y., North Tonawanda—Pierce-Brown Fdry. Co., S. Brown, Officer—machinery and equipment for proposed addition to foundry plant.

N. Y., Rochester—Atlantic Supply House, 61-65 Front St.—one belt driven ice breaker (used or new).

O., Bucyrus—Woodruff Printing Co., job printers, A. Woodruff, Purch. Agt.—job press (power).

O., Cleveland—The Fisher Body Ohio Co., East 140th St. and Coit Rd.—equipment for proposed factory in Flint, Mich.

O., Columbus—Eureka Stone & Marble Co., 179 West Maple St., P. McDonough, Vice Pres. and Genl. Mgr.—special machinery for making sandstone shapers and cutters.

O., Columbus—Finks Bakery, 234 South 4th St., H. Fink, Mgr.—complete equipment for bakery including mixers, etc.

O., Poland—Bd. of Educ. (Springfield Rural School District), J. A. Withers, Clk. —complete vocational machinery and equipment for proposed school to be constructed at Petersburg, O.

Okla., Oklahoma City—Scotch Tone Co., 2 West 6th St., W. P. Westfall, Purch. Agt.—power job printing press and power paper cutter.

Pa., Bradford—W. P. Brinton, Jr., 183 Kennedy St.—one small belt driven double end air compressor.

Pa., Coatesville—Coatesville Boiler Works —machinery and equipment for plant.

Pa., Conshohocken—Montgomery Fdry. & Fittings Co.—equipment for proposed 100 ton foundry addition.

Pa., New Brighton—Damascus Crucible Steel Casting Co.—machinery and equipment for proposed branch plant at Hammond, Ind.

Pa., New Cumberland—A. Hanker—machinery and equipment for proposed plant for the manufacture of a patent window with locking and lifting devices.

Pa., Phila.—Eagle Knitting Mills, 12th and Arch Sts., M. B. Goldberg, Purch. Agt. —full fashion hosiery machines and winders.

Pa., Phila.—Finkelstein Bros., 303 South St.—shoe machinery for factory.

Pa., Phila.—Globe Ticket Co., 112 North 12th St.—printing machinery for proposed plant.

Pa., Phila.—F. Pearson & Co., Inc., 1011 Chestnut St., N. Albrecht, Purch. Agt.— looms for the manufacture of plush in proposed factory.

Pa., Phila.—Ricards Mfg. Co., 614 Market St.—punches, cutters and machines for the manufacture of leather and canvas goods.

Pa., Phila.—Unique Knitting Co., 1324 North Lawrence St., N. R. Kline, Purch. Agt.—latch needle machines, ribbing machines and loopers for the manufacture of hosiery.

R. I., Providence—The City Bd. of Contract & Supply—delivering and erecting 2 portal gantry cranes of the revolving hammer head type, at Municipal Wharf, Fields Point.

S. D., Fairfax—The Advertiser (newspaper)—one No. 5 linotype.

Tenn., Manchester—Coffee County, N. H. Meriwether, Co. Engr.—complete crushing plant and miscellaneous road building machinery, for construction of county road system.

Wash., Aberdeen—The Port of Grays Harbor, office of Comn., 206 East Wishkah St., F. H. Lamb, Pres., J. A. Vance, Secy. —will receive bids until Sept. 23, for one 5 ton lumber handling mill type crane, equipped with lumber grapple 75 ft. span. Further information on application.

W. Va., Glen White—E. E. White Coal Co.—additional mining and handling machinery, etc., for proposed $300,000 improvement program.

W. Va., Huntington—C. F. Wilcoxen, 9th St.—one 10 ft. power brake for sheet metal works.

Wis., Peshtigo—Thompson Bros., manufacturer of pleasure boats—woodworking machinery.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances — No. 2 foundry iron up $3 in Birmingham; advances also reported in Pittsburgh, Philadelphia, Cincinnati and Chicago. Wage advance of 20 per cent plus increased fuel costs, reflected in higher steel quotations both at mills and warehouses. Steel rails and tin plates form the only two exceptions to the general advance in price. A minimum of $1.90 on shapes and plates has been established by the leading interest, but independents generally are quoting $4@$5 per ton above this rate. A maximum of $2@$2.25 per 100 lb., f.o.b. Pittsburgh, has applied on actual sales during the week.

Tin quoted at 33c. as against 32½c. per lb. in New York. Lead now 5.62c.@5.65c. as compared with 5.55c.@5.60c. per lb., in St. Louis. All fabricated brass and copper, up ½c. per lb. in New York warehouses.

Linseed oil (5 bbl. lots), 99c. as against 97c. per gal., in Chicago; no change in New York and Cleveland.

Declines—Slight tendency to shade zinc prices; quotations unchanged in East St. Louis. No other declines reported in New York, Cleveland or Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	28.27
Southern Ohio No. 2	32.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	32.44
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.64
Virginia No. 2	31.17
Basic	31.14
Grey Forge	31.50
CHICAGO	
No. 2 Foundry local	30.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	33.00
Basic	26.00
Bessemer	30.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Cincinnati	15.0	10.0	4.75
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cleveland	7.5	5.0	4.5
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40@2.60	4.03	3.50	4.00
No. 12	2.45@2.65	4.08	3.55	4.05
No. 14	2.50@2.70	4.13	3.60	4.10
No. 16	2.70@2.90	4.23	3.70	4.20
Black				
Nos. 17 and 21.	3.00@3.25	4.40	4.05	4.70
Nos. 22 and 24.	3.05@3.30	4.45	4.10	4.70
Nos. 25 and 26.	3.10@3.35	4 50	4.15	4.75
No. 28	3.15@3.40	4 60	4.25	4.85
Galvanized				
Nos. 10 and 11.	3.15@3.40	4.60	4.10	4.85
Nos. 12 and 14.	3.25@3.50	4.70	4.20	4.95
Nos. 17 and 21.	3.55@3.80	5.00	4.50	....
Nos. 22 and 24.	3.70@3.95	5.15	4.80	5.40
No. 26	3.85@4.10	5.30	4.95	5.55
No. 28	4.15@4.40	5.60	5.25	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	68	56½	¾ to 1¼	44½	29½
		LAP WELD			
2	61	49½	2	39½	25½
2½ to 6	65	53½	2½ to 4	42½	29½
7 to 8	62	49½	4½ to 6	42½	29½
9 to 12	61	48½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	66	55½	¾ to 1¼	44½	30½
2 to 3	67	56½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	59	48½	2	40½	27½
2½ to 4	63	52½	2½ to 4	43½	31½
4½ to 6	62	51½	4½ to 6	42½	30½
7 to 8	58	45½	7 to 8	35½	23½
9 to 12	52	39½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	47%	57½%	45½%	62½%	48½%
2½ to 6 in. steel lap welded	57%	44%	55½%	42½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.14	3.50	3.90
Cold rolled strip steel	6.50	8.25	7.25
Floor plates	5.20	4.91	5.50
Cold finished shafting or screw	3.65	3.45	3.70
Cold finished flats, squares	4.15	3.95	4.20
Structural shapes (base)	3.04	2.76	2.90
Soft steel bars (base)	2.94	2.66	2.80
Soft steel bar shapes (base)	2.94	2.66	2.80
Soft steel bands (base)	3.74	3.06	3.55
Tank plates (base)	3.04	2.76	2.90
Bar iron (2.35 at mill)	2.94	2.21	2.80
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.62½
Tin, 5-ton lots, New York			33.00
Lead (up to carlots), St. Louis 5.62@5.65; New York			6.20
Zinc (up to carlots), St. Louis 6.25; New York			7.00
	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	19.00
Antimony (Chinese), ton spot	5.50	7.50	6.50
Copper sheets, base	21.50	21.50@21.75	23.00
Copper wire (carlots)	15.75	17.50	16.25
Copper bars (ton lots)	20.00	22.50	19.50
Copper tubing (100-lb. lots)	24.75	24.50	23.00
Brass sheets (100-lb. lots)	18.25	19.50	18.75
Brass tubing (100-lb. lots)	22.50	22.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	16.75	17.50	15.75
Brass wire (carlots)	18.75	19.50	.....
Zinc sheets (casks)	9.00	9.00	.....
Solder (½ and ½), (caselots)	23.00	23.50	20.00
Babbitt metal (fair grade)	24.50	42.75	36.00
Babbitt metal (commercial)	11.12½	16.00	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.25	11.50
Copper, heavy, and wire	11.75	11.75	11.25
Copper, light, and bottoms	9.75	10.00	10.25
Lead, heavy	4.75	4.50	4.50
Lead, tea	4.25	3.50	3.50
Brass, heavy	7.00	6.00	9.00
Brass, light	6.00	5.25	6.25
No. 1 yellow brass turnings	6.50	6.25	6.75
Zinc	3.00	3.50	3.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.075	.10	.10
Wiping cloths, 13½x20½, per lb.	.08	.11	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.91	1.14	.99
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	11.50	
Coke, prompt foundry, Connellsville	per net ton	14.50@15.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50-10%
1½ and 1¼x3 in. up to 12 in.	25%	65%	50-10-10%
With cold punched sq. nuts	30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	.....	$4.00 off
Button head bolts, with hex. nuts	20%	$3.90 net	.....
Hex. head and hex. nut bolts	25%	.....	65-5%
Lag screws, coach screws	45%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	35%	50-10-5%	50-5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	10%	.....	.....
Semi-finished nuts ⅝ and larger	65%	70-10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.00	3.25	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	55%	65%	60%
Rivets, tinned	55%	65%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$4.50	$3.50	$3.35
Cone heads, ditto (net)	4.60	3.60	3.45
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50-%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	30-5%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.40
Cloth	3.02	.....	3.20

B. C., Vancouver—The Harbor Comrs., 712 Pender St., A. D. Swan, 10 Phillips Place, Montreal, P. Q., Engr.—will receive bids until Oct. 2, for mechanical equipment of new pier on Burrord Inlet, including the following, all electrically operated:
Eight 3 ton cranes.
Four 9 ton freight elevators.
Four 1,000 lb. escalators, 20 ft. rise.
Four 200 ton capstans at 100 ft. a min.
Four tractors and trailers, particulars to be submitted by bidders.

Ont., Goderich—Goderich Evaporator Co. —prices on equipment for new evaporator and also for cannery (proposed).

Ont., Grimsby Beach — The Grimsby Brick & Terra Cotta Co.—prices wanted on new machinery for plant damaged by fire.

Ont., London—The London Curling Club, F. Ashplant, Secy.—Artificial Ice Arena—prices wanted for installing artificial ice plant.

Ont., North Bay—W. Milne & Sons—one 12 in. double edge band saw, edgers, trimmers, planers, all electrically driven for mill to be rebuilt, at Trout Mills.

Ont., Port Arthur—The Thunder Bay Paper Co., J. E. Schnabel, Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., Purch. Agt.—ground wood trailing screen, primary centrifugal screen, one 84 in. standard wet machine, for use on ground wood pulp, one 600 ton hydraulic press.

Que., Montreal—Mount Royal Metal Co., Mill and Oak Sts., G. H. R. Hutchins, Purch. Agt., 31 St. Nichols St.—complete equipment for foundry.

Sask., Regina—The Imperial Oil, Ltd.—equipment for oil refinery, capacity 3,500 bbls., at Calgary, Alta. (proposed).

Metal Working Shops

Calif., Berkeley—B. Porter, c/o J. W. Plachek, Archt., 2014 Shattuck Ave., will soon award the contract for the construction of a 1 story garage and auto salesroom, on Durant and Shattuck Ave.

Calif., Oakland — California Foundries Co., foot of 19th Ave., awarded the contract for the construction of a 1 story foundry. Estimated cost $8,000.

Calif., San Francisco—J. Weisbein, c/o H. C. Baumann, Archt., 251 Kearny St., awarded the contract for the construction of a 1 story garage and battery service station, on 4th Ave. and Geary St. Estimated cost $22,000. Noted Aug. 17.

Ill., Chicago—E. C. Frazier, Archt., 30 North Dearborn St., is preparing plans and will soon receive bids for the construction of a 1 story, 100 x 130 ft. garage, at 1215-23 West Harrison St., for J. A. Hannah, 1045 Fulton Market. Estimated cost $50,000.

Ill., Chicago—H. A. Mulder, Archt., 140 South Dearborn St., is receiving bids for the construction of a 1 story, 125 x 130 ft. garage, on Clark St. near Devon St., for D. R. Guthman, 6730 North Clark St. Estimated cost $60,000.

Ind., East Chicago—The International Lead Refining Co., 151st St. and McCook Ave., plans to build a 1 story, 50 x 100 ft. lead refinery. Estimated cost $27,000. Private plans.

Ind., Ft. Wayne—J. E. Ford, Douglass and Harrison Sts., plans to build a 2 story, 150 x 250 ft. garage, on Main St. Estimated cost $75,000. C. R. Weatherhogg, Citizens Trust Bldg., Archt.

Ind., Indianapolis—The Conduit Automobile Co., 314 North Delaware St., plans to build a 3 story, 63 x 210 ft. automobile sales and service station, on North Meridian Ave. Estimated cost $150,000. F. B. Hunter, State Life Bldg., Archt.

Ind., Indianapolis—Dusenburg Motor Co., 515 Lemcke Bldg., plans to build a 1 story, 60 x 200 ft. auto factory, on South Harding St. Estimated cost $29,000. Private plans.

Ind., Indianapolis—Olin Sales Co., North Meridan St., plans to build a 3 story automobile sales and service station. Estimated cost $150,000. Rubush & Hunter, Archts. Noted Aug. 3.

Ind., Richmond—The Automotive Gear Co., c/o J. W. Mueller, Archt., Richmond, plans to build a 1 story, 400 x 600 ft. gear factory, on 8th St. Estimated cost $35,000.

La., New Orleans—The Amer. Can Co., Cortez and Toulouse Sts., awarded the contract for the construction of a 4 story, 221½ x 221½ ft. assembling and distributing warehouse, with 45 x 60 ft. tower, on Cortez and Toulouse Sts.

Mass., East Boston (Boston P. O.)—The Boston Sand & Gravel Co., 88 Broad St., Boston, is building a 1 story, 40 x 80 ft. machine shop, on Condor St., here. Estimated cost $10,000. P. F. Ayer, Secy.

Mich., Detroit—The Studebaker Corp., Brush and Piquette Aves., awarded the contract for the construction of a 4 story, 95 x 259 ft. automobile plant addition, on Jefferson and Clark Aves.

Mich., Flint—The Fisher Body Ohio Co., East 140th St. and Colt Rd., Cleveland, O., had plans prepared for the construction of a 2 story, 202 x 401 ft. factory for the manufacture of auto bodies, on Wilcox St., here. A. Kahn, 1,000 Marquette Bldg., Archt.

Mich., Jackson—The Hayes Wheel Co., Jackson and Douglas Sts., awarded the contract for the construction of a 1 story, 50 x 60 ft. factory, and a 1 story 100 x 160 ft. power house. Estimated cost $250,000.

N. Y., Elmira—The Decker Automobile Co., 109 West Church St., is receiving bids for remodeling and also constructing an addition to its 3 story building, including a new salesroom on the first floor. Estimated cost $40,000. O. Dochstader, 374 West 1st St., Archt.

N. Y., Jamestown—General Metalsmiths Inc., 313 Prendergast Ave., awarded the contract for the construction of a 1 story, 60 x 250 ft. factory, on Hopkins Ave., for the manufacture of architectural, mortuary, and industrial bronze and copper products. Estimated cost $150,000.

N. Y., New York—The Dept. of Plant & Structures, Municipal Bldg., plans to build a repair shop at 16th St. and Ave. C, for the Dept. of Street Cleaning, and will soon award the contract for clearing of site, excavating, sheeting and bracing for the foundation of same.

N. Y., New York—A. Jawitz Realty Co., c/o J. Fisher, Archt. and Engr., 25 Ave. A, will build a 1 story, 100 x 200 ft. garage on East 173rd St. Estimated cost $75,000.

N. Y., New York—J. Pearlbinder, c/o C. Kreymborg, Archt. and Engr., 2534 Marion Ave., will build a garage, on Westchester Ave. Estimated cost $100,000.

N. Y., Rochester—W. Steele & Sons Co., Archts., 16th and Arch Sts., Phila., will receive bids until Sept. 9 for the construction of a factory, on Plymouth Ave. near Barton St., here, for the Electric Storage Battery Co., 181 South Clinton St.

N. Y., St. George—The Dept. of Police, R. E. Enright, Comr., 240 Center St., New York, will soon award the contract for the construction of a 2 story garage for the 66th Precinct Police Station, on Richmond Terrace and Wall St., here.

N. Y., Tonawanda—Jewett & Co., Military Rd., Buffalo, awarded the contract for the construction of a 2 story, 56 x 262 ft. plant, for the manufacture of stoves and ranges, here, to replace the one recently destroyed by fire. Noted Aug. 24.

O., Cleveland—The Amer. Shipbuilding Co., 4900 Division Ave., awarded the contract for the construction of a 1 story, 60 x 500 ft. factory. Estimated cost $120,000. M. E. Tarr, Pres.

O., Cleveland—J. Bookatz, 656 East 99th St., awarded the contract for the construction of a 1 story, 66 x 120 ft. garage, on Superior Ave. near 103rd St. Estimated cost $50,000.

O., Cleveland—H. H. Bramson, Cadillac Bldg., awarded the contract for the construction of a 1 story, 75 x 115 ft. garage and stores, at 725 East 125th St. Estimated cost $40,000.

O., Cleveland—S. Richland, 8328 Quincey Ave., had plans prepared for the construction of a 1 story, 56 x 100 ft. garage on East 103rd St. and St. Clair Ave. Estimated cost $40,000. M. Altschuld, 5116 Woodland Ave., Archt.

O., Cleveland — The Yeiser Co., 1183 Holmden Ave., (automatic faucets) awarded the contract for the construction of a 1 story, 28 x 84 ft. machine shop. Estimated cost $40,000.

O., East Cleveland (Cleveland P. O.)—A. M. Gordon, 207 Schofield Bldg., had plans prepared for the construction of a 2 story, 41 x 177 ft. garage, on Lakefront Ave. Estimated cost $50,000. A. F. Janowitz, Permanent Bldg., Cleveland, Archt.

O., Youngstown—Youngstown Boiler & Tank Co., Ft. of Mahoning Ave., awarded the contract for the construction of a 1 story addition to boiler factory. Estimated cost $50,000. Architect not announced.

Pa., Oil City—W. H. Crosby, Archt., Masonic Bldg., is receiving bids for the construction of a 3 story, 70 x 80 ft. garage for E. M. Bowen, (Ford Agency), Oil City. Estimated cost $40,000.

Pa., Phila.—Zerbey & Hollaway, 4713 North Broad St., are receiving bids for the construction of a 1 story 20 x 34 ft. and a 100 x 147 ft. garage, on 15th St. and Wyoming Ave. Estimated cost $75,000. C. F. Parker, 5018 Schuyler St., Archt.

Pa., Pittsburgh—The Englert Mfg. Co., 2133 East Carson St., is having plans prepared for the construction of a 2 story, 68 x 120 ft. battery factory, on South 25th and Jane Sts. H. Lang, 1617 Brownsville Rd., Archt.

Pa., Pittsburgh—The Stroh Steel Hardening Process Co., Westinghouse Bldg., plans to build a steel foundry addition, on Chateau and Ridge Sts. Estimated cost $250,000. Private plans.

Pa., Starbrick (Warren P. O.)—The Warren Steel Car Co., awarded the contract for the construction of a 1 story, 90 x 260 ft. factory, near Warren. Estimated cost $75,000. Noted Aug. 17.

Pa., York—The York Mfg. Co., plans to build a 5 story, 60 x 100 ft. addition to its plant for the manufacture of ice and refrigerating machinery. Estimated cost $300,000. Architect's name withheld.

W. Va., Huntington—J. J. West, Archt., 611 9th Ave., will remodel and build a 1 story, 90 x 115 ft. addition to garage and bakery, for Stroehmann Baking Co., 5th St. and 7th Ave. Estimated cost $100,000.

W. Va., Logan—R. E. Matticks, is having plans prepared for the construction of a 3 story, 52 x 120 ft. garage and repair shop. Estimated cost $40,000. Meanor & Handloser, Robson-Pritchard Bldg., Huntington, W. Va., Archts.

Wis., Bear Creek—H. A. Rasmussen will build a 1 story, 50 x 90 ft. garage. Estimated cost $40,000.

Wis., Marinette—H. A. White, 2,000 Hall Ave., awarded the contract for the construction of a 1 story, 117 x 117 ft. garage and repair shop. Estimated cost $40,000.

Wis., Prescott—J. A. Miller, awarded the contract for the construction of a 1 and 2 story, 50 x 70 ft. garage. Estimated cost $40,000.

Wis., West Allis — The Allis-Chalmers Mfg. Co., National Ave., manufacturers of machinery, awarded the contract for the construction of a 1 story, 176 x 406 ft. carpenter shop.

General Manufacturing

Mass., Cambridge—The Cambridge Rubber Co., 748 Main St., awarded the contract for the construction of a 4 story, 83 x 102 ft. factory. Estimated cost $100,000.

Mass., East Boston—The Boston & Lockport Block Co., 100 Condor St., awarded the contract for the construction of a 1 story, 90 x 170 ft. factory. Estimated cost $35,000.

Mass., Malden—The Yale Knitting Co., Sherman St., awarded the contract for the construction of a 4 story knitting plant addition. Estimated cost $40,000. Noted March 9.

Mass., Waltham—Watkins-Potter Press, 77 Washington St., N., Boston, awarded the contract for the construction of a 1 story, 90 x 160 ft. printing plant, here. Estimated cost $60,000.

N. Y., Buffalo—The Sikes Chair Co., 500 Clinton St., plans to rebuild a portion of its factory destroyed by fire. Estimated cost $20,000. Architect not announced.

N. Y., Geneva—The Standard Optical Co., 172 Lyceum St., plans to repair and to rebuild portion of its plant, destroyed by flood. Estimated cost $5,000. Architect not announced.

N. Y., Niagara Falls—The Carborundum Co., Buffalo Ave. and 18th St., awarded the contract for the construction of a 4 story, 50 x 57 ft. grain storage building.

N. Y., Woodhaven (Jamaica P. O.)—The Proper Silk Hosiery Mills, Inc., 276 5th Ave., New York, awarded the contract for the construction of a 3 story, 50 x 202 ft. factory for the manufacture of hosiery here. Estimated cost $100,000.

Pa., Glenshaw—L. B. Duff, Engr., 712 Magee Bldg., Pittsburgh, is receiving bids for the construction of a 2 story, 64 x 113 ft. warehouse and manufacturing plant, at Wittmer Station, for the Ball Chemical Co., c/o Engineer. Estimated cost $50,000. Noted Aug. 24.